

REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA, AND GALA-
PAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935, IN 1936, IN 1937, AND IN 1938.

DIGENETIC TREMATODES OF FISHES FROM
THE GALAPAGOS ISLANDS AND THE
NEIGHBORING PACIFIC

(PLATES 32-50)

By HAROLD W. MANTER

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 2, NUMBER 14

ISSUED MARCH 27, 1940

THE UNIVERSITY OF SOUTHERN CALIFORNIA PRESS

LOS ANGELES, CALIFORNIA

TABLE OF CONTENTS

	<i>Page</i>
INTRODUCTION	329
DESCRIPTION OF SPECIES	
ASPIDOGASTREA	
ASPIDOGASTRIDAE	
<i>Lobatostoma pacificum</i> , new species	330
GASTEROSTOMATA	
BUCEPHALIDAE	
<i>Bucephalus varicus</i> , new name	335
<i>Bucephalus introversus</i> , new species	338
<i>Prosorhynchus ozakii</i> Manter, 1934	339
<i>Prosorhynchus aculeatus</i> Odhner, 1905	340
<i>Prosorhynchus rotundus</i> , new species	340
<i>Prosorhynchus gonoderus</i> , new species	342
<i>Prosorhynchus pacificus</i> , new species	343
PROSOSTOMATA	
GYLIAUCHENIDAE	
Megasoleninae	
<i>Choanodera caulolati</i> , new genus, new species	345
<i>Apocreadium mexicanum</i> Manter, 1937	348
<i>Apocreadium longisinosum</i> Manter, 1937	348
ALLOCREADIIDAE	
<i>Lepocreadium bimarinum</i> , new species	348
<i>Opechona pharyngodactyla</i> , new species	350
<i>Opechona orientalis</i> (Layman, 1930)	352
<i>Lepidapedon hancocki</i> , new species	353
<i>Lepidapedon nicolli</i> Manter, 1934	354
<i>Pseudolepidapedon balistis</i> , new species	355
<i>Pseudocreadium scaphosomum</i> , new species	356
<i>Pseudocreadium spinosum</i> , new species	359
<i>Anisoporus eucinostomi</i> , new species	360
<i>Anisoporus thyrinopsi</i> , new species	362
<i>Dactylostomum vitellosum</i> , new species	363
Opecoelus and Opegaster	364
<i>Opecoelus mexicanus</i> , new species	365
<i>Opecoelus xenistii</i> , new species	366
<i>Opecoelus inimici</i> Yamaguti, 1934	367
<i>Opegaster acuta</i> , new species	367

	<i>Page</i>
<i>Opegaster pentedactyla</i> , new species	369
<i>Opegaster parapristipomatis</i> Yamaguti, 1934	370
<i>Coilocaecum tropicum</i> , new species	371
<i>Opecoelina pacifica</i> , new species	373
<i>Cymbephallus carangi</i> Yamaguti, 1938	374
<i>Parvacreadium bifidum</i> , new genus, new species	374
<i>Bianium adplicatum</i> , new species	376
<i>Myzotus vitellosus</i> , new genus, new species	377
<i>Plagioporus gastrocotylus</i> , new species	380
<i>Hamacreadium mutabile</i> Linton, 1910	381
<i>Hamacreadium oscitans</i> Linton, 1910	382
<i>Podocotyle mecopera</i> , new species	383
<i>Podocotyle breviformis</i> , new species	384
<i>Helicometra torta</i> Linton, 1910	386
<i>Helicometra sinuata</i> (Rud.)	387
<i>Helicometra fasciata</i> (Rud.)	387
<i>Helicometrina nimia</i> Linton, 1910	387
<i>Labrifer secundus</i> , new species	388
 ACANTHOCOLPIDAE	
<i>Stephanostomum megacephalum</i> , new species	390
<i>Stephanostomum longisomum</i> , new species	392
<i>Stephanostomum casum</i> (Linton)	394
<i>Stephanostomum multispinosum</i> , new species	394
<i>Stephanostomum hispidum</i> (Yamaguti)	395
<i>Stephanostomum anisotremi</i> , new species	397
<i>Dihemistephanus brachyderus</i> , new species	399
 HAPLOSPLANCHNIDAE	
<i>Haplospplanchnus acutus</i> (Linton)	401
<i>Haplospplanchnus pomacentri</i> Manter, 1937	401
 MONORCHIIDAE	
<i>Proctotrema longicaecum</i> , new species	401
<i>Proctotrema costaricae</i> , new species	403
<i>Paramonorchoides bivitellosus</i> , new species	404
<i>Telolecithus tropicus</i> , new species	406
<i>Proctoeces magnorus</i> , new species	407
<i>Tergestia laticollis</i> (Rud.)	408
 ACCACOEIIDAE	
<i>Tetrochetus proctocolus</i> , new species	410
 HETEROPHYIDAE	
<i>Paracryptogonimus americanus</i> , new species	413
<i>Siphoderoides vancouveri</i> , new genus, new species	416

HEMIURIDAE

Page

<i>Parahemiurus merus</i> (Linton)	417
<i>Parahemiurus ecuadori</i> , new species	419
<i>Dinurus barbatus</i> (Cohn)	420
<i>Dinurus longisinus</i> Looss, 1907	421
<i>Elytrophallus mexicanus</i> , new genus, new species	421
<i>Mecoderus oligoplitis</i> , new genus, new species	424
<i>Sterrhurus fusiformis</i> (Lühe)	426
<i>Lecithochirium microstomum</i> Chandler, 1935	426
<i>Lecithochirium magnaporum</i> , new species	428
<i>Lecithochirium muraenae</i> , new species	429
<i>Derogenes varicus</i> (O. F. Müller)	430
<i>Theletrum lissosomum</i> , new species	431
<i>Theletrum gravidum</i> , new species	433
<i>Aponurus trachinoti</i> , new species	434
<i>Leurodera pacifica</i> , new species	435
<i>Gonocercella pacifica</i> , new genus, new species	437
<i>Hirudinella clavata</i> (Menzies)	439
<i>Hirudinella beebei</i> Chandler, 1937	440

SYNCOELIIDAE

<i>Paronatrema mantae</i> , new species	440
---	-----

APOROCOTYLIDAE

<i>Psettarium tropicum</i> , new species	443
--	-----

HOST LIST	445
-----------	-----

SUMMARY AND CONCLUSIONS	451
-------------------------	-----

LITERATURE CITED	454
------------------	-----



DIGENETIC TREMATODES OF FISHES FROM THE GALAPAGOS ISLANDS AND THE NEIGHBORING PACIFIC†

(PLATES 32-50)

HAROLD W. MANTER
University of Nebraska

During January, February, and March of 1934 it was the privilege of the writer, aided by the Carnegie Institution of Washington, to accompany the third Allan Hancock Expedition to the Galapagos Islands. A preliminary note concerning the trematode parasites collected has been published (Manter, 1934a). Several papers dealing with various helminths collected have appeared (Manter, 1937; Meserve, 1938; Cuckler, 1938; Gilbert, 1938; Van Cleave, in press). The present paper deals with the digenetic trematodes collected from fishes. Five hundred and thirty-two fishes, including nearly one hundred different species, were examined. Approximately 80 per cent of the species and 43 per cent of the individuals harbored some kind of trematode. Meserve (1938) records 22 species of Monogenea. Eighty-two species of Digenea from 80 different hosts are recorded in this paper. In a number of instances the fish host was unidentified or tentatively identified. A number of fishes were preserved and sent to the United States National Museum, where identifications were made by E. D. Reid and G. S. Myers, to whom the writer is indebted for such assistance. Fishes thus identified are indicated by an asterisk (*) in the host list (p. 445).

Type specimens of all new species described in this paper are deposited in the United States National Museum. Paratypes are deposited in the Allan Hancock Foundation at The University of Southern California.

The trematodes were killed in formol-alcohol-acetic solution, under a cover glass, with application of slight pressure. Most were stained with Delafield's hematoxylin. Serial sections were made of most species.

Descriptions of new genera and species are written in the form of diagnoses that are intended to be sufficiently complete to serve as fairly adequate descriptions. It will be more or less evident that the host distribution and the geographical distribution of these trematodes are of

† Studies from the Zoological Laboratories, University of Nebraska, No. 203.

considerable biological interest especially in comparison with the trematode fauna of the tropical Atlantic. This aspect of the study will be considered in a separate paper.

Practically every digenetic trematode collected is accounted for in this paper with the exception of immature specimens and several species of Didymozoonidae. The latter, usually encysted, were not favorably preserved for specific identification. Numerous specimens (and several species) of immature distomes corresponding to the *Distomum fenestratum* of Linton were collected. Some of these at least are probably identical with the Atlantic forms.

Unless otherwise indicated, measurements are in mm. In most cases, usual terminology descriptive of trematodes is followed. The term "forebody" is used to refer to that portion of the body anterior to the acetabulum. Nicoll's term "ecsoma" is used for the tail appendage of hemiurids. Lloyd's (1938) term "pre-somatic pit" is used for the ventral pit of certain hemiurids. Following the pars prostatica in many trematodes is a swollen region (inside or outside the sinus sac or the cirrus sac) with tall transparent cells. Manter (1934) refers to this structure as a "prostate vesicle." Although Park (1936) has called it a "cirrus vesicle," the term "prostatic vesicle" is used in this paper. Its function is unknown.

The collection and study of these parasites were made possible by the kindness and co-operation of Captain Allan Hancock and the Carnegie Institution of Washington, D.C. Most of the study was made at the University of Nebraska. The manuscript was completed in 1939 at the Rocky Mountain Biological Laboratory. The writer wishes to express appreciation to Dr. Waldo Schmitt for many kindnesses and favors in connection with the work. Considerable technical assistance in preparing specimens and in routine work on the manuscript was rendered by students employed under the National Youth Administration at the University of Nebraska, especially by Miss Rita Giesken.

ASPIDOGASTREA Faust and Tang, 1936

Aspidogastridae Poche, 1907

Lobatostoma pacificum, new species

(Plate 32, figs. 1, 2)

Host: *Trachinotus paloma* Jordan and Starks

Location: Intestine

Locality: Charles Island, Galapagos

Number: Many. 52 specimens were mounted

The genus *Lobatostoma* was named by Eckmann in 1932. The word *Lobatostoma* (Eckmann, 1932, p. 396) is a synonym, the error in spelling being obviously typographical. The genus contains *L. ringens* (Linton) and *L. kemostoma* (MacCallum and MacCallum).

SPECIFIC DIAGNOSIS OF *LOBATOSTOMA PACIFICUM*

Total body length 2.632 to 4.279. Forebody, which may be more or less retracted dorsal to the disc, 0.352 to 0.862. Anterior end with 2 large ventral lobes and 3 dorsal lobes, the median of which is smaller than the others. Ventral disc 1.552 to 2.160 in length or slightly less to slightly more than $\frac{1}{2}$ total body length. Full width of disc seen in only one specimen where the disc was 1.755 long and 1.215 wide. Number of marginal loculi almost always 32. In one of 12 specimens it was 34, and in another it was possibly 31 (Bychowsky and Bychowsky, 1934, have indicated some variation in number of locules in the disc of *Aspidogaster* species). Median loculi 15, each divided by a more or less inconspicuous median longitudinal ridge. Total number of loculi, therefore, 62 to 64. Marginal sense organs present between marginal loculi. Hind-body (posterior to disc) 0.810 to 2.562, always more than $\frac{1}{2}$ length of disc, sometimes somewhat longer than disc; posterior end of body tapered almost to a point. Prepharynx 0.247 to 0.465; pharynx cylindrical 0.144 to 0.170 long by 0.100 to 0.127 wide; esophagus short; cecum reaching about to posterior edge of disc or slightly beyond, not reaching posterior end of body by some distance.

Genital pore muscular, slightly to the left, just anterior to disc, opposite esophagus or base of pharynx. Testis single, large, ovoid, longer than wide, dorsal to disc (in one of 52 specimens it was posterior to the disc). Cirrus sac (fig. 2) ovoid with thick wall of loose fibers, containing a few gland cells and surrounded by gland cells; seminal vesicle tubular, free, much coiled, extending backward as far as ovarian level. Ovary pyriform with its narrowed (posterior) portion recurved anteriorly; oviduct extends backward; Laurer's canal long, extending backward, its termination not determined. Vitellaria in 2 lateral rows from near anterior end of disc to end of cecum. Uterus extending to near posterior end of body; uterine seminal receptacle present; metraterm muscular, cylindrical, slightly shorter than cirrus sac, surrounded by gland cells; just posterior to metraterm is a thin-walled, somewhat coiled portion of the uterus, possessing a few gland cells in its wall (fig. 2). Eggs 65 to 76 by 34 to 42 μ , usually 70 to 73 by 37 to 41 μ . The short

unpaired excretory vesicle forks to form two crura which reach to the anterior end of the disc.

The name *pacificum* indicates that this is the first species of the genus known from the Pacific Ocean.

Comparisons. *L. pacificum* differs from *L. ringens* in number of loculi on the disc (the various descriptions of *L. ringens* give the marginal loculi as 36 to 42 and the transverse loculi as 16 to 18 in number); in a longer portion of the body posterior to the disc, and in that the eggs do not become so large (eggs are commonly 80 μ long in *L. ringens*, and one record gives 103 by 58 μ).

L. pacificum is more similar to *L. kemostoma*, agreeing in number of loculi, in egg size, and in long hindbody. On the basis of the figures and descriptions given for *L. kemostoma*, *L. pacificum* seems to differ in the following respects: (1) the dorsal median lip is smaller than the others; (2) the disc is relatively longer, at least about $\frac{1}{2}$ total body length and usually over $\frac{1}{2}$ (in *L. kemostoma* it is about $\frac{1}{3}$ body length); (3) the ovary and almost always the testis are dorsal to the disc rather than posterior to it; (4) the vitellaria extend from near the anterior end of the disc to the end of the cecum rather than from behind the middle of the disc to near the posterior end of the body.

A 1.417 mm specimen of *L. pacificum* was immature and a 1.830 mm specimen contained but one egg.

All three species of *Lobatostoma* are found in *Trachinotus* species, although *L. ringens* also occurs in a variety of other fishes.

Discussion. The muscular septum separating a dorsal portion of the body from the ventral disc is very conspicuous especially in young specimens. The dorsal portion contains the intestinal cecum, the vitellaria, and some of the uterus; but most of the reproductive organs and also the excretory crura lie in the ventral portion. The septum has the same musculature as the body wall, and it seems evident that it represents the body wall of the posterior portion of the larva as the posterior sucker advanced forward to form the ventral disc.

GASTEROSTOMATA Odhner, 1905

Bucephalidae Poche, 1907

Odhner (1905), recognizing the important differences between gasterostomes and other digenetic trematodes, established the suborders Gasterostomata and Prosostomata. He studied *Prosorhynchus squamatus* in

great detail and contrasted the genus *Prosorhynchus* with *Gasterostomum* (now *Bucephalus*) chiefly on the structure of the anterior end which bears in *Prosorhynchus* a "rostellum-like structure" called the rhynchus. Nicoll later (1914) elevated these differences to subfamily rank, recognizing *Prosorhynchinae* (with a rhynchus) and *Bucephalinae* (with an anterior sucker). Although Eckmann (1932) does not recognize subfamilies of the *Bucephalidae*, the subdivision seems a convenient one and is followed by Nagaty (1937).

In recent years gasterostomes have received considerable attention, and the number of species in the relatively few genera has increased rapidly. There is disagreement among authors as to the validity of a number of species and a few genera, but this confusion normally accompanies the early taxonomic history when a group is being rapidly developed. The following recent authors have contributed materially to our knowledge of the group: Ozaki (1928), Eckmann (1932), Verma (1936), Bhalerao (1937), and Nagaty (1937).

The genus *Bucephalus* possesses a ventrally directed sucker with definite radial muscles, aperture, and cuplike cavity together with a crown of retractile processes known as fimbriae or tentacles. These curious appendages, conspicuous when extended but very inconspicuous when retracted, have come to be the characteristic feature of the genus, varying in number and form in different species. When extended, they often resemble horns. It is a curious circumstance that the generic name *Bucephalus* (= ox head), given to the cercaria because of the hornlike appearance of the furcae of the tail, should prove to be appropriate for the adult because of entirely different structures.

Some confusion might arise in recognition of the genus *Bucephalus* because of failure to note the presence of tentacles when these are completely retracted. Under such conditions the tentacles are evidenced only as small papillae of which the most ventral (on each side of the aperture of the sucker) or the lateral pair is likely to be most conspicuous. Study of these protuberances will reveal a central porelike depression. *Rhipidocotyle kathetostomae* Manter, 1934 shows what is now familiar to the author as characteristic retracted tentacles, and its name is here changed to *Bucephalus kathetostomae* (Manter) n. comb. Although the shape of its tentacles remains unknown, the species can be distinguished from others in the genus *Bucephalus*. Van Cleave and Mueller (1934) considered the appearance of the tentacles in *Bucephalus elegans* Woodhead an indication of age or senescence. While immature individuals may

lack tentacles, my own experience indicates that even when these structures are fully developed they are often completely retracted and are then all but invisible.

The "hood" surmounting the sucker of *Rhipidocotyle* assumes various forms. In *R. baculum* it is oval and kidney or bean shaped without papillae or corners; in several species it is pentagonal; or it may bear papillae as in the type species, *R. galeatum* (Rud.). These papillae are sometimes more or less extensible as in *R. longleyi*; they then suggest the tentacles of *Bucephalus*, to which they are probably homologous.

Eckmann (1932) lists *Prosorhynchus squamatus* Odhner as a synonym of *P. crucibulus* (Rud.) and redescribes what she considered this species collected from *Epinephelus* sp. from the Suez. Nagaty (1937) accepts this synonymy. Judging, however, from the detailed descriptions of Odhner, 1905, and from specimens of Eckmann's material kindly sent by Dr. Witenberg, the writer cannot agree with this conclusion and is not satisfied that *P. squamatus* is a synonym of *P. crucibulus*. Odhner apparently studied type material of both species. *P. squamatus* differs from *P. crucibulus* primarily in its much weaker rhynchus not evidently cone or wedge shaped, and in a linear rather than a triangular arrangement of gonads. The latter character may vary somewhat (according to Nicoll, 1910). *P. crucibulus* tends to be more elongate. The egg of each species is without a polar process.

The Suez material referred by Eckmann to *P. crucibulus* has such distinctive eggs with very conspicuous polar processes that it seems to represent a new species altogether. The writer has never observed such processes in any species of *Prosorhynchus*, and they almost certainly could not have been overlooked by Odhner and others in *P. crucibulus*. The name *Prosorhynchus caudovatus* n. nom. is here proposed for the *Prosorhynchus crucibulus* of Eckmann. This name indicates the taillike process on the egg, the distinguishing character of the species.

Nagaty (1937) apparently re-establishes the validity of *Alicornis* MacCallum. Several other genera of gasterostomes have very uncertain status. *Gotonius* is generally considered to be a synonym of *Prosorhynchus*. The writer agrees with Nagaty in the following: *Prosorhynchoides* Dollfus, 1929 a synonym of *Bucephalopsis*; *Skrjabiniella* Issaitschikow, 1928 a synonym of *Prosorhynchus*. Shen (1930) named *P. vaneyi*, a species peculiar in possessing a triple crown of spines around the "rostrum" or rhynchus. Eckmann (1932) placed *P. vaneyi* in the genus *Dollfusina*, which name being preoccupied was changed (by Eckmann,

1932) to *Dollfustrema*. Nagaty considers *Dollfustrema* a synonym of *Prosorhynchus*. A gasterostome of this type has been collected by the writer at Tortugas, Florida, and its study leads to the conclusion that the anterior spines might well be considered a generic character. However, the genus *Mordvilkovia* Pigulewsky, 1931 has "conspicuous cuticula folds" on the rhynchus in such a manner as to suggest the spines of *Dollfustrema*, and the writer is inclined to consider *Mordvilkovia* a valid genus with *Dollfustrema* and *Dollfusina* as synonyms.

The genus *Pseudoprosorhynchus* Yamaguti, 1938, with its intertesticular ovary, seems to be a synonym of *Neidhartia* Nagaty, 1937.

In accordance with the above views, the following genera are recognized: subfamily *Bucephalinae*—*Bucephalus*, *Bucephalopsis*, *Rhipidocotyle*, *Dolichoenterum*; subfamily *Prosorhynchinae*—*Prosorhynchus*, *Alcicornis*, *Neidhartia*, *Mordvilkovia*.

***Bucephalus varicus*, new name**

(Plate 32, figs. 3-9)

Synonym: *Bucephalus polymorphus* of Nagaty, 1937

Host: A young specimen of an unidentified species of *Caranx*,
or jack

Location: Stomach and intestine

Locality: Bahia Honda, Panama

Number: About 18 from a single host

What is apparently the same species of *Bucephalus*, which Nagaty records as *B. polymorphus* from several fishes (especially "*Trachynotus*" and "*Caranax*" species) from the Red Sea, has been collected by me from both the Atlantic and Pacific. My Atlantic specimens are from *Caranx ruber* (Bloch), *Caranx latus* Agassiz, and *Caranx bartholomaei* Cuv. and Val., all from Tortugas, Florida. The Pacific material is from a "small yellow jack" taken at Bahia Honda, Panama.

Nagaty identified his specimens as *B. polymorphus*. Comparing his description and figures with those given by Eckmann for authentic *B. polymorphus*, it seems to the writer that sufficient differences exist for a separate species, even assuming that seven tentacles are present in *B. polymorphus* (6 are described). *B. polymorphus* is from fresh-water hosts; the mouth is at midbody; the testes are oblique and the ovary more or less lateral to the anterior testis; the cirrus sac is only $\frac{1}{5}$ body length; the uterus extends well anterior to the vitellaria but is at the same time very weakly developed posterior to the mouth, where there

are few eggs none of which are posterior to the genital pore. Contrasted with this, Nagaty's material is from marine fishes, the mouth is almost always well posterior to midbody, the testes are tandem; the ovary always anterior to the anterior testis; the cirrus sac is longer than $\frac{1}{5}$ body length; the uterus rarely extends anterior to the vitellaria and is better developed posterior to the mouth, while eggs can occur posterior to the genital pore in the Red Sea specimens (see Nagaty's fig. 8) and usually do so in my American specimens. The most constant difference is the anterior position of the ovary which is never lateral to the anterior testis. The next most important difference is probably the length of the cirrus sac. Both the anterior and posterior extent of the uterus is less in young specimens. In the writer's experience gasterostomes either are specific or tend to show host specificity. This tendency indicates that the *Bucephalus* from the related marine hosts is likely to be distinct from *B. polymorphus*. The marine species is therefore renamed *B. varicus*, a name indicating its variability.

Nagaty, impressed by the variability of the tentacles, considered *B. elegans* Woodhead, 1930 a synonym of *B. polymorphus*. The writer does not agree with this conclusion. The eggs of *B. elegans* are approximately twice the size of those of *B. polymorphus*.

The American specimens of *B. varicus* do show considerable variation, some of which is probably due to degree of contraction, some to degree of maturity, and some perhaps to host influence. Egg size was rather constant within a specimen but varied considerably in different specimens, especially from different hosts. But eggs from the Pacific host were intermediate between extremes found in different Atlantic hosts. Thus, Pacific specimens have eggs somewhat wider than those from *Caranx ruber* at Tortugas, but the difference is not deemed significant considering all variations. All the variations of the tentacles were noted as by Nagaty with the additional occasional occurrence of a third small ventral process near the tip of the tentacle (fig. 6). The writer interprets the threadlike process on the tips of some tentacles as a product of disintegration and believes the slightly elevated bosses to represent completely retracted tentacles.

The following diagnosis is based on specimens from both the Atlantic and the Pacific but does not include Nagaty's data which, however, agree in all essential points. Although the collections from the three hosts are considered to be one and the same species, some of the measurements are separated for purposes of comparison.

SPECIFIC DIAGNOSIS OF BUCEPHALUS VARICUS

A. Panama material from <i>Caranx</i> species					
Length	0.892	1.087	1.134	1.269	
Width	0.187	0.285	0.210	0.232	
Anterior					
sucker	0.112	0.120	0.120	0.120	
Eggs . . . 17 to 20 by 11 to 14 μ					
B. Tortugas material from <i>Caranx ruber</i>					
Length	0.705	0.750	0.862		
Width	0.195	0.202	0.180		
Anterior sucker.....	about 0.060				
Eggs.....	19 to 20 by 9 to 10 μ				
C. Tortugas material from <i>Caranx latus</i>					
Length	0.999	1.147	1.107	1.458	
Width	0.127	0.127	0.150	0.130	
Anterior sucker.....	0.076 to 0.093				
Eggs.....	17 to 20 by 11 to 16 μ				

Tentacles 7, usually retracted; each tentacle with a large basal and a small distal prong. In two instances (fig. 6) a minute spinelike additional prong was seen on the under side near the tip of the tentacle. The distal half of the tentacle seems to be retractile into the basal portion, telescopelike. Upon disintegration this distal portion of the tentacle seems to disappear early, leaving a finely granular threadlike core. Mouth posterior to midbody, usually considerably so, sometimes posterior to all gonads (fig. 8), sometimes between the testes, sometimes anterior to all gonads (fig. 5). Intestine sac shaped. Excretory vesicle I shaped, extending anterior to vitellaria almost to the anterior sucker. Gonads tandem, testes usually large and close together; posterior testis overlapping cirrus sac. Cirrus sac more than $\frac{1}{5}$ body length but varying considerably in length, with saclike seminal vesicle, long pars prostatica, large genital lobe and atrium, long atrial tube, muscular near the pore; genital pore near posterior end of body. Ovary ovoid, directly anterior to anterior testis. Vitellaria in 2 lateral groups, follicles usually crowded close together, usually 12 to 16 on each side, usually in region of ovary but in extended specimens reaching well anterior to ovary. Yolk ducts extend backward and unite between the testes. From the right descending duct a tube leads anteriorly toward the ovary (fig. 3). Nagaty does not describe this long loop of the yolk ducts. Uterus may or may not extend anterior to vitellaria, usually extending posterior to genital pore (but not in young specimens). Eggs 17 to 20 by 9 to 16 μ , usually about 17 to 20 by 10 to 14 μ .

Bucephalus introversus, new species

(Plate 32, figs. 10-12)

<i>Hosts</i>	<i>Locality</i>	<i>Number</i>
(Type) <i>Seriola</i> species	Port Culebra, Colombia	11
<i>Seriola dorsalis</i> (Gill)	Port Utria, Colombia	15
<i>Seriola dorsalis</i>	Isabel Island, Mexico	1
<i>Seriola dumerili</i> (Risso)	White Friar Islands, Mexico	3
<i>Caranx hippos</i> (Linn.)	Port Culebra, Colombia	1
Location: Stomach. Once on the gills, never in the intestine		

SPECIFIC DIAGNOSIS OF BUCEPHALUS INTROVERSUS

Body elongate, cylindrical, blunt at anterior end, rounded and little tapering at posterior end. In almost all specimens the anterior end was introverted into the anterior part of the body for a distance often $\frac{1}{3}$ and sometimes almost $\frac{1}{2}$ body length. Four specimens with anterior end everted measured 1.202 to 1.707 in length and 0.225 to 0.285 in thickness. Anterior sucker muscular with ventral aperture. Dorsal wall of sucker rhynchuslike with 5 or 6 distinct longitudinal bands of diagonal muscles (or glands?). When inverted, the anterior sucker resembles still more a rhynchus, since the aperture of the sucker is not evident. Seven tentacles usually completely retracted. Tentacle long and narrow (fig. 12), with a single large basal process near the base. Diameter of anterior sucker 0.170 to 0.345. Mouth normally posterior to midbody (1.035 from anterior end in a 1.707 specimen; 0.817 in a 1.202 specimen). Even when the anterior end is well inverted, the mouth is usually posterior to midbody but under these conditions may be nearer the apparent anterior end. Pharynx variable, usually longer than wide, 0.037 to 0.061 in width. Intestine dorsal and slightly anterior or posterior to mouth. Gonads tandem, to the right, just posterior to pharynx. Testes large, spherical, tandem, close together. Cirrus sac large, $\frac{1}{3}$ body length or often somewhat more; its base overlaps (to the left) at least the posterior testis and may reach to ovary, containing an elongate-oval seminal vesicle, long pars prostatica, and large prostate gland. Genital atrium with a complicated system of lobes and folds (fig. 10); atrial tube variable in shape and length, its circular muscles sometimes conspicuous. Genital pore close to posterior tip of body, very close to excretory pore, which is, however, separate. Ovary spherical, pretesticular, about at pharynx level. Vitellaria in 2 lateral groups, more or less clumped, extending anterior and posterior to pharynx a short distance. Follicles on

left side almost always extending farther back than those on the right, often reaching to anterior testis; number of follicles 11 to 17 on each side. Uterus, chiefly in transverse coils, fills most of body, extending anterior to vitellaria, in extended specimens reaching almost to anterior sucker; inverted sucker pushing against uterus. Uterus not extending posterior to genital pore. Eggs large, yellow brown, rather thick shelled, tapering slightly toward anterior end, 22 to 26 by 12 to 15 μ , most eggs about 24 by 14 μ . Excretory vesicle extending slightly anterior to ovary but not anterior to vitellaria.

The name *introversus* is given to indicate the striking characteristic of inversion of the anterior end.

Comparisons. No other species of *Bucephalus* exhibits the inversion of the anterior end. The stomach of the host is an unusual location for a gasterostome, most of which occur in the intestine. Manter (1931) has previously recorded a gasterostome from the gills of a fish, and one specimen of *B. introversus* was found on the gills. However, the gills probably are not a normal place for these parasites which more likely wandered up from the stomach after death of the host.

B. uranoscopi is more elongate, with two processes on the tentacle; its uterus does not extend so far anteriorly; and the eggs are smaller. *B. kathetostomae* (Manter) has an anterior sucker of similar structure but has an entirely different shape; the vitellaria, uterus, and mouth have different positions, and the eggs are smaller. *B. polymorphus* seems to be most similar but is less elongate, the vitellaria are more anterior, the cirrus sac shorter. *B. varicus* differs in form of anterior sucker, in egg size, and in genital lobes.

***Prosorhynchus ozakii* Manter, 1934**

(Plate 33, fig. 13)

Hosts and Localities:

1. An unidentified, spotted, grouperlike fish from Isabel Island, Mexico
2. *Mycteroperca olfax* (Jenyns) from Albemarle Island, Galapagos
3. *Mycteroperca xenarcha* Jordan from Albemarle Island, Galapagos

Location: Ceca

Number: One to several specimens in a host

The Mexican material had eggs 26 to 29 by 14 to 19 μ , while the Galapagos specimens (from *Mycteroperca olfax* and *M. xenarcha*) had

eggs measuring 31 to 34 by 15 to 19 μ . This difference is not considered of specific significance.

No differences considered of specific value could be found to distinguish this species from *P. ozakii* Manter, 1934 from *Epinephelus niveatus* from 90 fathoms at Tortugas, Florida. The body form of some of the Pacific material tends to be wider for its length (e.g. 1.026 by 0.450, 1.103 by 0.562). But one specimen (fig. 13) was 1.296 by 0.465, which is more like the proportions of *P. ozakii*. The uterus in the Pacific material reaches to the anterior limit of the vitellaria or slightly beyond, which position is slightly more anterior than in the Atlantic form. But other characters are identical, e.g. distribution of vitellaria, gonads, position of mouth, size of eggs.

The species is much like *P. aculeatus* except that the vitelline follicles are in widely separated, longitudinal, lateral rows.

Prosorhynchus aculeatus Odhner, 1905

(Plate 33, fig. 14)

Host: Gymnothorax species

Location: Intestine

Locality: Charles Island, Galapagos

Number: 2, both in one host

These specimens have the small rhynchus, diagonal testes, arched vitellaria, egg size, and other characteristics of *P. aculeatus*. The writer considers *P. uniporus* Ozaki a synonym of *P. aculeatus*. *P. magniovatus* Yamaguti differs only in its larger eggs. *P. aculeatus* seems to be a widely distributed species in morays.

Prosorhynchus rotundus, new species

(Plate 33, fig. 15)

Host: *Rypticus safronaceus bicolor* (Val.)

Location: Intestine

Locality: Albemarle Island, Galapagos

Number: 3 specimens from a single host

SPECIFIC DIAGNOSIS OF PROSORHYNCHUS ROTUNDUS

Body relatively small and broad, ovoid, rounded at each end but more broadly rounded posteriorly, 0.712 to 0.825 by 0.360 to 0.367. Body, including the flattened surface of the rhynchus, covered with scalelike spines. Rhynchus fairly large and well developed, the flattened, exposed anterior surface measuring 0.150 to 0.157 in diameter. Internal portion

of rhynchus cone shaped, tapering slightly to a fine point which in all three specimens is recurved at its tip to form a hooklike crook. Mouth almost exactly at midbody; pharynx about 0.075 in diameter; sac-shaped intestine extending forward almost to base of rhynchus. Gonads variable in location. Ovary to the right, slightly anterior to but overlapping pharynx; always overlapping and usually entirely dorsal (or ventral) to anterior testis. Vitellaria in 2 separated lateral groups extending from level of pharynx to base of rhynchus. The 2 groups of follicles converge anteriorly and almost but not quite meet near base of rhynchus. Total number of follicles about 23. Uterus filling most of body, extending forward beyond anterior limit of vitellaria, overlapping basal portion of rhynchus, posteriorly reaching to level of genital pore. Eggs very large in proportion to body size, 39 to 44 by 20 to 23 μ .

Testes close together, tandem, diagonal or lateral to each other; normally probably tandem. Anterior testis overlapping ovary, about at level of pharynx. Both testes wider than long; posterior testis overlapping anterior edge of cirrus sac. Cirrus sac large, 0.300 to 0.390 by 0.110 to 0.136. It may be more than half body length. It contains a coiled tubular seminal vesicle, long pars prostatica, large prostate gland, and has a very thick wall (11 to 12 μ). Genital atrium subspherical, thin walled, with large genital lobes. It is surrounded by a very well-developed mass of gland cells for which the term *atrial gland* is suggested. Such glands have been described in *P. squamatus* by Odhner, who compared their appearance to that of a shell gland and considered that they secreted the capsule for the spermatophore. Genital pore a short distance in front of the anterior end, median or to the left. Excretory pore terminal; excretory vesicle extending to posterior testis.

Comparisons. This species is notable for the small body size together with very large egg size. *P. costai* has even larger eggs but differs in its more elongate body, more posterior uterus, shape and position of testes, and relative size of the cirrus sac. *P. rotundus* differs from *P. aculeatus* in its better-developed rhynchus, more anterior mouth, separated vitellaria, and much larger eggs. *P. magniovatus* Yamaguti, 1938 has eggs almost as large but has a smaller flat rhynchus, confluent vitellaria, and much more posterior mouth. *P. scalpellus* McFarlane, 1936 is probably most similar but differs in more narrow eggs, more elongate body, more posterior mouth, and more rounded testes. It lacks the hooklike curve at the tip of the rhynchus, and the host is different. Additional material may show, however, that *P. rotundus* is a synonym of *P. scalpellus*.

Discussion. The variation in the position of the posterior testis seems to be determined by pressure from the cirrus sac. When the cirrus sac is large and extends very far forward, it pushes the testis forward even until it may be anterior and to the left of the ovary. The fact that in such specimens the testis is misshaped by such pressure indicates that it may have been done by the process of killing the worm under a cover glass.

***Prosorhynchus gonoderus*, new species**

(Plate 33, fig. 16)

Host: a yellow-spotted grouper

Location: Ceca

Locality: James Island, Galapagos

Number: Many. 2 specimens, immature, of what is probably the same species were collected together with *P. ozakii* from what seemed to be the same species of fish from Isabel Island, Mexico.

SPECIFIC DIAGNOSIS OF PROSORHYNCHUS GONODERUS

Body elongate, somewhat flattened, widest posterior to rhynchus where there is a fairly distinct expansion of the body, tapering gradually from this region to a pointed posterior end. Length 1.480 to 2.295; width 0.380 to 0.510. Rhynchus very well developed, muscular, flattened anteriorly, pointed conelike posteriorly, longer than wide, width 0.247 to 0.307. Mouth far anterior, between $\frac{1}{3}$ and $\frac{1}{4}$ body length from anterior end; pharynx 0.562 to 0.076 in diameter; saclike intestine directed forward. Gonads far anterior, well in front of midbody, clumped together overlapping one another. Ovary subspherical, at level of pharynx, to the left, close to intestine, slightly pretesticular, overlapping dorsally the anterior testis. Vitellaria in 2 lateral groups, not much extended longitudinally, tending to be 2 or 3 follicles wide, extending from level of pharynx to the rhynchus, usually overlapping posterior end of the rhynchus. Posterior limit of vitellaria (which is only slightly more or less than that of the pharynx) never more than $\frac{1}{3}$ body length from anterior end of body. Uterus does not extend anterior to ovary but does extend posterior to genital pore. Mehlis' gland posterior to ovary, among the three gonads. Eggs golden yellow brown in color, 27 to 31 by 15 to 19 μ , usually about 27 to 28 by 17 μ , shells rather thick. Testes subspherical, diagonally placed; anterior testis to the left, overlapping ovary; posterior testis slightly separated, to the right, overlapping anterior testis. Cirrus sac large but, because of the far anterior location of the gonads, does not usu-

ally reach the posterior testis by some distance (it did so in only one of 16 specimens). Genital atrium large, atrial gland well developed; genital pore some little distance in front of posterior end of body. Several specimens showed recently formed spermatophores. Excretory pore ventral; excretory vesicle conspicuous in most specimens, extending forward to posterior limit of the gonads.

The name *gonoderus* (*gono* = gonads; *derus* = neck) refers to the location of the gonads in the neck region.

Comparisons. This species is notable for the far anterior location of the mouth and of the reproductive organs. The body seems to have elongated posteriorly, leaving these organs anterior, but they are relatively close to the anterior end as well as being very far from the posterior end. The species differs from all others in the genus in this location of the gonads, and from most other species in the fact that the uterus does not extend anterior to the ovary.

***Prosorhynchus pacificus*, new species**

(Plate 33, fig. 17)

This species was collected four times, as follows:

<i>Host</i>	<i>Locality</i>
<i>Mycteroperca olfax</i> (Jenyns) (type host)	Albemarle Island, Galapagos (type locality)
<i>Mycteroperca xenarcha</i> Jordan	Albemarle Island, Galapagos
Unidentified grouper	James Island, Galapagos

Location: Ceca

Number: Several to many. In the case of both *M. olfax* and *M. xenarcha*, *Prosorhynchus ozakii* also occurred in small numbers.

SPECIFIC DIAGNOSIS OF PROSORHYNCHUS PACIFICUS

Body elongate, about equally wide along most of its length, blunt at anterior end, tapering to a rounded, somewhat pointed posterior end. Length 1.206 to 1.444; width 0.300 to 0.397. Rhynchus large, muscular, cone shaped, longer than wide, width 0.172 to 0.232. Mouth between $\frac{1}{3}$ and $\frac{1}{2}$ body length from anterior end; sac-shaped intestine extending forward; pharynx 0.054 to 0.061 in diameter. Gonads near midbody. Ovary spherical, at pharynx level, to the right, overlapping anterior testis; vitellaria in two widely separated lateral groups, extending from about the level of the ovary halfway to anterior end of body; follicles

tending to be arranged in a straight, linear row on each side. Posterior limit of vitellaria always (in 54 specimens) more than $\frac{1}{3}$ body length from the anterior end and often at midbody level or beyond. Mehlis' gland between testes. Uterus not extending anterior to ovary but does extend posterior to genital pore. Eggs light yellow, fairly thin shelled, 24 to 27 by 12 to 17 μ , usually about 25 by 17 μ .

Testes large, subspherical, chiefly postovarian, diagonal, and not far apart, sometimes almost tandem. Cirrus sac large, typical for genus, usually overlapping posterior testis but not reaching to this testis in 20 of 54 specimens. Genital pore some little distance anterior to posterior end of body. Excretory pore terminal; excretory vesicle extending to anterior testis.

Measurements of the type specimen are: Length 1.350; width 0.352; rhynchus diameter 0.215; mouth to anterior end 0.615; pharynx 0.060; cirrus sac 0.427 by 0.113; eggs 24 to 27 by 12 to 14 μ .

The name, *pacificus*, is for the locality.

Comparisons. *P. pacificus* differs in its large rhynchus from such species as *P. squamatus*, *P. grandis*, *P. aculeatus*, *P. ozakii*, and *P. magnio-vatus*. It differs from *P. crucibulus* in separated rows of vitellaria, more anterior mouth, more narrow eggs, and more tandem testes. It differs from *P. scalpellus*, *P. facilis*, and *P. apertus* in that the uterus does not extend anterior to the ovary. An undescribed species of *Prosorhynchus* from several species of *Mycteroperca* at Tortugas, Florida, is very similar to *P. pacificus*, the only important difference being in size and color of the eggs. It is interesting to note that of 3 species of *Prosorhynchus* from *Mycteroperca* studied by the writer, this species is much more similar to Atlantic collections than to its neighbor, *P. gonoderus*, from the Pacific.

PROSOSTOMATA Odhner, 1905

Gyliauchenidae Ozaki, 1933

Megasoleninae Manter, 1935

The new genus described below is related to *Apocreadium* Manter, 1937 and is another allocreadid-like distome with lymphatic vessels. Ozaki (1934) reported the first distome, *Petalocotyle nipponica*, with a lymphatic system. At that time, Ozaki considered *Petalocotyle* in the family Allocreadiidae. Manter (1935) discovered that *Megasolena* Linton and *Hapladena* Linton both have well-developed lymphatic vessels and her-

maphroditic sacs. He considered them nearer the amphistomes than the distomes and tentatively classified them in the family Opistholebetidae, subfamily Megasoleninae. The same author (Manter, 1937) described the genus *Apocreadium* which, while possessing lymphatic vessels, lacks all trace of a cirrus sac and shows many similarities to the *Anallocreadii*nae. Ozaki (1937, 1937a) held that *Gyliauchenidae* (with lymphatic vessels) could be separated from *Opistholebetidae* (without lymphatic vessels). He then considered *Petalocotyle* in the *Gyliauchenidae* but did not definitely allocate *Megasolena* or *Hapladena* to any family, although implying relationship to *Gyliauchenidae*. Park (1938) complicated this tendency toward amphistome relationship by describing the genus *Carassotrema*, which has a hermaphroditic sac (and single testis) as does *Hapladena*, but lacks lymphatic vessels. The single testis is not of more than generic significance. Park's comparison to *Deradena* is based on an error by Linton of confusing specimens of *Hapladena* with specimens of *Haplospalchnus*, as explained by Manter (1937a). The genus *Deradena* is a synonym of *Hapladena*, and most of the species described by Linton belong in the genus *Haplospalchnus*. *Carassotrema* is indeed very similar to *Hapladena*, differing only in lacking lymphatic vessels. The peculiar hermaphroditic sac is so unique that there seems little doubt that *Carassotrema* is to be classified along with *Hapladena* in the subfamily *Megasoleninae*. Park's work thus indicates that the presence or absence of lymphatic vessels may not be of such great significance as to warrant the placing of the *Megasoleninae* among the amphistomes. Furthermore, there appear to be lymphatic vessels in a species of *Opechona* and in a species of *Pseudolepidapedon* described below. The writer's view (Manter, 1937) that the *Allocreadiidae* show evident relationship to the *Paramphistomidae* is further supported by these recent findings. Sooner or later, more information will determine the placing of the subfamilies and families involved. For the present, the family *Gyliauchenidae* should probably be considered in the superfamily *Allocreadioidea*.

***Choanodera caulolatili*, new genus, new species**

(Plate 33, fig. 18)

Hosts: *Caulolatilus anomalus* (Cooper) (type host)
Caulolatilus sp.

Location: Intestine

Localities: Cerros Island, Mexico (type locality)
James Island, Galapagos

Number: Many in each host

SPECIFIC DIAGNOSIS OF CHOANODERA CAULOLATILI

The body is elongate, fairly thick, almost equally wide along most of its length, only slightly tapering and rounded or subtruncate at each end. In life, orange yellow in color. Size 2.565 to 3.307 by 0.945 to 1.282 (a specimen 1.40 long contained but one egg). The thick cuticula covered with scales or spines which are close together in the anterior part of the body but gradually becoming fewer until rather sparse near posterior end of body. Edges of the forebody folding in ventrally, separated anteriorly but converging posteriorly to meet just posterior to acetabulum. (This conspicuous and peculiar character gives the forebody the shape of a funnel flaring anteriorly but with its ventral side open. Sometimes the folds almost meet ventrally, forming a longitudinal slit along the length of the forebody. Under pressure the folds may be flattened out laterally to form an expansion of the forebody.) Oral sucker subterminal, round, 0.165 to 0.225 in diameter; acetabulum subcircular, often slightly wider than long, 0.262 to 0.337 in diameter, its aperture usually wider than long. Forebody $\frac{1}{4}$ to $\frac{1}{5}$ body length. Prepharynx short, often extending down over anterior part of pharynx; pharynx unmodified, usually somewhat longer than wide but of variable proportions, 0.104 to 0.127 in length by 0.078 to 0.141 in width; esophagus very short and surrounded by gland cells; intestinal bifurcation approximately midway between suckers; ceca extending to near posterior end of the body where each ends blindly. Genital pore median at anterior edge of acetabulum. Testes tandem, close together, smooth or with slightly crenulated border, extending between the ceca; anterior testis about at midbody level. Testes somewhat variable, especially the anterior testis, usually wider than long. They are sometimes subequal in size, but either one may be considerably larger than the other. Posttesticular space from slightly to considerably longer than forebody length. Seminal vesicle an ovoid sac just posterior to and partly overlapping the acetabulum, narrowing (dorsal to acetabulum) to a tubular pars prostatica surrounded by a well-developed prostate gland. Just anterior to the middle of the acetabulum the tube bends ventrally and is joined by the uterus to form a tubular genital sinus or ductus hermaphroditicus. Cirrus and cirrus sac lacking.

Ovary a short distance anterior to the anterior testis and to the right of midline, just median to the right cecum, about halfway between anterior testis and acetabulum, without distinct lobes and almost always somewhat extended in a diagonal direction. Since it is somewhat broader at

one end, it assumes a heartlike shape tipped at varying angles. Mehlis' gland large, between ovary and anterior testis. Laurer's canal very large with thick walls, opening dorsally and medianly opposite the ovary. Uterus pretesticular but chiefly to the left of the ovary, becoming a straight, narrow tube dorsal to acetabulum where it joins the male duct. Large flask-shaped seminal receptacle to left of ovary or, more often, between ovary and acetabulum. Vitelline follicles large, extending from near posterior edge of the acetabulum to posterior end of body. (Anteriorly they may almost reach mid-acetabular level.) They are lateral, dorsal, and ventral to ceca and are confluent posterior to the testes. Eggs thin shelled, variable in size, 87 to 102 by 48 to 65 μ , usually 92 to 100 by 50 to 60 μ .

Excretory pore terminal; excretory vesicle extending to posterior testis where it forks into 2 tubules. The tubule on each side soon becomes double. A single pair of smaller tubules extends to near the posterior end of the body. Lymphatic vessels present. Four longitudinal vessels close to intestinal ceca can be seen at most body levels. One pair of these vessels extends dorsal to oral sucker. Anterior to the middle of the body the vessels are inconspicuous and often cannot be seen probably because in a collapsed state. The lymph vessels show no sign of branching.

GENERIC DIAGNOSIS OF CHOANODERA

Body thick, elongate, little tapering, spined, yellow orange. Forebody with edges folded ventrally and converging to meet at posterior edge of acetabulum. Acetabulum $\frac{1}{4}$ to $\frac{1}{5}$ from anterior end, larger than oral sucker. Prepharynx, pharynx, esophagus present; ani lacking. Genital pore median. Testes tandem, close together. Seminal vesicle and prostate gland free in parenchyma; cirrus sac and cirrus lacking; tubular genital sinus present. Ovary pretesticular, to the right, ovoid, tapering toward one end; seminal receptacle, Mehlis' gland, and Laurer's canal all well developed. Uterus largely to left of ovary. Vitellaria well developed. Eggs large, thin shelled. Excretory vesicle to posterior testis with 2 pairs of anterior and one pair of posterior tubules. Four longitudinal, unbranched lymph vessels. Type species: *Choanodera caulolati*.

The name *choanodera* is from *choan* (= funnel) and *dera* (= neck), and refers to the characteristic form of the forebody.

Comparisons. Choanodera is closely related to Apocreadium Manter, 1937. The ventrolateral folds of the forebody give a superficial resemblance to *Bianium*, which genus, however, is fundamentally different in possessing ani and a cirrus sac, and in lacking lymph vessels. Choanodera

differs from *Apocreadium* in the characteristic folds of the forebody and in the unbranched lymph vessels. Body spinés are better developed in *Choanodera*. The details of the reproductive system are practically identical in the two genera, differing only in specific characters.

The discovery of still another *Allocreadid*-like distome with lymphatic vessels increases the known number of such genera to five: namely, *Petalocotyle*, *Megasolena*, *Hapladena*, *Apocreadium*, and *Choanodera*. *Carassotrema* must be considered a related genus. This group of trematodes shows relationship to the amphistomes, on one hand, and to the *Anallocreadiinae* and *Lepocreadiinae*, on the other.

***Apocreadium mexicanum* Manter, 1937**

Host: *Labrisomus xanti* Gill

Location: Intestine

Locality: Tangola Tangola, Mexico

Number: 18 specimens from a single host

***Apocreadium longisinosum* Manter, 1937**

Hosts: *Cheilichthys annulatus* (Jenyns)

Spheroides angusticeps (Jenyns)

Location: Rectum

Locality: Galapagos Islands

Number: 2 to 10 in a host, total of 15 collected from 3 hosts

***Allocreadiidae* Stoss., 1904**

***Lepocreadium bimarinum*, new species**

(Plate 34, figs. 19-21)

Hosts: *Pimelometopon pulcher* (Ayres) (type host)

Bodianus diplotaenia (Gill)

Location: Intestine

Locality: Cerros Island, Mexico (type locality)

Socorro Island, Mexico

Number: 5 specimens from a single *P. pulcher*; 2 to several collected from each of 3 *B. diplotaenia*

The following diagnosis is based chiefly on 4 specimens from *P. pulcher* and one from *Lachnolaimus maximus* (Walbaum) from Tortugas, Florida. The specimens from *Bodianus* were dead when collected and partly macerated, although they agreed in every significant detail with the forms from *Pimelometron*.

SPECIFIC DIAGNOSIS OF *LEPOCREADIUM BIMARINUM*

Body ovate to elongate according to contraction state, usually widest near posterior end which is broadly rounded; spined almost to posterior end; without definite eye spots; length 1.200 to 1.900; greatest width 0.412 to 0.552; forebody 0.305 to 0.555 or about $\frac{1}{3}$ to $\frac{1}{5}$ total body length. Oral sucker 0.143 to 0.210; acetabulum 0.195 to 0.266, somewhat larger than oral sucker, sucker ratio about 4:5 to 3:4, or in a few cases the acetabulum is only slightly larger than oral sucker. Short, wide prepharynx; pharynx usually longer than wide, 0.099 to 0.130 long by 0.061 to 0.110 wide; esophagus short and wide; intestinal bifurcation not far anterior to acetabulum or (if forebody is extended) about midway between suckers; ceca extending to near posterior end. Genital pore slightly to the left a short distance anterior to acetabulum, near intestinal bifurcation.

Testes smooth, rounded or ovoid, tandem, close together, in posterior half of body. Posttesticular space 0.285 to 0.442, rather variable, may be $\frac{1}{3}$ body length or only about $\frac{1}{6}$. Cirrus sac longer than wide, of almost equal width except narrowing near posterior end, not extending posterior to acetabulum, sometimes not reaching middle of acetabulum, sometimes reaching past the middle, containing a short muscular tube near its base, a wider pars prostatica in its middle half and a cirrus (straight or slightly sinuous); external vesicle a somewhat coiled tube extending almost to the ovary. Ovary spherical or ovoid, smooth, immediately pretesticular, slightly to the right; seminal receptacle largely dorsal to posterior half of ovary; vitelline follicles large, sometimes not reaching acetabulum by a short distance, sometimes just reaching the acetabulum, in a few cases reaching almost to mid-acetabular level; dorsal, lateral, and ventral to ceca. Uterus to left and anterior to ovary; metraterm a little shorter than cirrus sac. Spines in cirrus or metraterm not seen. Eggs usually collapsed, 51 to 70 by 25 to 32 μ , usually 53 to 64 by 27 to 32 μ . Excretory vesicle not well seen but apparently reaching to the anterior testis.

The name *bimarinum* indicates the occurrence of this species in both the Atlantic and Pacific Ocean.

Comparisons. *L. bimarinum* differs distinctly from *L. pegorchis* (Stoss.), *L. ovale* Manter, *L. trulla* (Linton), and *L. clavatum* (Ozaki) in that the vitellaria do not extend anterior to the acetabulum. It is most similar to *L. album* (Stoss.) but differs in that the acetabulum is larger than the oral sucker and the cirrus sac does not extend posterior to the acetabulum. The eggs of *L. album* become larger or at least wider, and

the vitellaria extend to the middle of the acetabulum or even anterior to the acetabulum.

The elongated specimen from the Atlantic (fig. 21) agreed almost perfectly with one elongated specimen from *Pimelometron* (not figured) from the Pacific. Variations in the anterior extent of the vitellaria and posterior extent of the cirrus sac in other specimens led to the conclusion that these more elongate specimens did not represent another species. Decision that specimens from the 3 hosts represented one species was arrived at before relationships of the hosts were considered. It is interesting to note that the 3 host genera are related fishes.

***Opechona pharyngodactyla*, new species**
(Plate 34, figs. 22, 23)

Host: *Trachinotus rhodopus* (Gill) (type host)
Zalocys stilbe Jordan and McGregor

Location: Intestine

Localities: Tenacatita Bay, Mexico (type locality)
Port Utria, Colombia
Clarion Island, Mexico

Number: Several to many

SPECIFIC DIAGNOSIS OF OPECHONA PHARYNGODACTYLA

Body flattened, widest near acetabular level but almost equally wide along middle half, anterior end tapering, posterior end broadly rounded. Cuticula with spines which become sparser and scattered posteriorly. Body size 1.714 to 2.903 by 0.397 to 0.487. Oral sucker somewhat longer than wide, 0.102 to 0.126 in transverse diameter. Acetabulum subcircular, about $\frac{1}{4}$ body length from anterior end, 0.146 to 0.187 in diameter; sucker ratio approximately 2:3. Forebody 0.405 to 0.750. Posterior end of oral sucker cupped (calyxlike) in a thin layer of circular muscles. Prepharynx long but retractile so that measurements vary from 0.034 to 0.300, flaring at base which often extends down along the side of the pharynx (fig. 23). Pharynx elongate, 0.136 to 0.153 by 0.068 to 0.093, approximately twice as long as wide. Four anteriorly directed, fingerlike, almost transparent, thin-walled processes on anterior end of pharynx (fig. 23). These four processes varied considerably in length and might even extend into the oral cavity. The two lateral processes are the largest, and the right seemed always larger than the left. Esophagus and pseudoesophagus short, approximately equal, combined length less than pharynx; in-

testinal bifurcation a short distance anterior to acetabulum; ceca extending to near posterior end of body.

Genital pore a long, diagonal slit near left anterior edge of acetabulum, its aperture approximately same length as aperture of acetabulum. Testes smooth, tandem, intercecal, posterior to midbody, longer than wide, close together. Posttesticular space 0.337 to 0.570, or about $\frac{1}{6}$ body length. Cirrus sac curved, claviform, extending to or usually slightly beyond posterior edge of acetabulum; external and internal seminal vesicles present, the latter usually inconspicuous; pars prostatica large; cirrus thick walled. Genital atrium large with thick more or less folded walls continuous with a short, thick-walled metraterm. Ovary globular, median, separated from anterior testis by the large spherical seminal receptacle; Laurer's canal present; gland cells around uterus at base of metraterm; vitellaria from posterior edge of acetabulum backward, surrounding ceca, confluent posterior to testes; eggs 60 to 68 by 34 to 54 μ , usually about 66 by 36 μ .

Excretory vesicle a narrow sinuous tube extending forward to posterior end of pharynx, receiving near its posterior end 2 pairs of small collecting tubules.

Discussion. The peculiar pharyngeal processes of this trematode seem to be unique. Specimens of *Opechona gracilis* (Manter) show very slight elevations of the anterior edge of the pharynx which suggest rudiments of such structures. These pharyngeal processes are very distinctly from the tissues of the pharynx but are not comparable to the lobed border of the pharynx in some trematodes (Megapera, Thysanopharynx).

Not mentioned in the above diagnosis are thin-walled tubes in the forebody similar to or possibly lymph vessels. Their number was not determined because of their winding, convoluted nature. One pair seems to extend near the lateral sides of the body, another pair along the sides of the prepharynx. None were seen posterior to the acetabulum.

Opechona pharyngodactyla differs from all other species in the genus in its pharyngeal processes. In extent of vitellaria it is like *Pharyngora retractilis* Lebour [considered by Nicoll to be a synonym of *O. bacillaris* (Molin)], *O. scombri* Yamaguti, and *O. orientalis* (Layman). It differs from all species, except possibly *O. scombri*, in the fact that the pharynx is always longer than the esophagus and pseudoesophagus combined. Its eggs are larger than those of *O. scombri* or *O. orientalis*. Its ovary is not trilobed as in *O. orientalis*.

Variable characters of *O. pharyngodactyla* include the length of the prepharynx, length of the pharyngeal processes, and the sizes of the internal and external seminal vesicles.

Opechona orientalis (Layman, 1930) Ward and Fillingham, 1934
(Plate 34, figs. 24, 25)

Synonym: *Pharyngora orientalis* Layman, 1930

Hosts and Localities: *Angelichthys* sp., angelfish, from unknown locality (taken from ship's tanks)

Paranthias furcifer (Cuv. and Val.)

from Clarion Island, Mexico

Small mackerel, Tagus Cove, Albemarle Island, Galapagos

Location: Intestine

Number: 8 specimens from a single *Angelichthys*

10 specimens from 2 of 13 *Paranthias*

The angelfish host was a fish which died in the tanks. These trematodes had lost body spines but otherwise were in fairly good condition, although they were dead when collected. Their characters seem to agree specifically with those of *O. orientalis*, a trematode previously reported by Layman (1930) and by Yamaguti (1934) from *Scomber japonicus*, *Spheroides rubripes*, and *Engraulis japonicus* from Peter the Great Bay and Toyama Bay. The specimens from *Angelichthys* (fig. 24) give the following measurements, all of which fall within the limits of *O. orientalis*: length 1.363 to 2.214; width 0.307 to 0.375; forebody about $\frac{1}{3}$ body length; oral sucker often elongate; prepharynx 0.165 to 0.285; pseudoesophagus shorter than esophagus, the 2 together being subequal to the prepharynx in length; sucker sizes and ratios as in *O. orientalis*; eggs 51 to 61 by 27 to 34 μ . The extent of the cirrus sac, of the vitellaria, size and shape of the genital atrium correspond exactly with *O. orientalis*. The excretory vesicle, undescribed for *O. orientalis*, extends to the pharynx, crossing the intestinal bifurcation ventrally. A second smaller and shorter branch of the vesicle extends in the left half of the body to the region of the base of the cirrus.

The ten specimens from *Paranthias furcifer* (fig. 25) were smaller (0.712 to 0.972 by 0.270 to 0.367 mm), the forebody shorter and wider, the prepharynx and esophagus only about the length of the pharynx, the vitellaria in each specimen reaching to the posterior edge of the acetabulum, the ovary more compact, the testes wider than long. But the speci-

mens from *Angelichthys* (fig. 24) were all greatly extended. The excessive extension of the forebody probably explains differences of these trematodes. A striking similarity between the trematodes from the 2 hosts is seen in the peculiar excretory system with the long vesicle extending median to the right intestinal cecum, bending ventrally anterior to the genital sinus to cross the intestinal bifurcation ventrally and reaching to the pharynx or even to midpharynx level. The excretory vesicle of all species of *Opechona* is supposedly a simple tube. The occurrence of another small longitudinal branch just median to the left cecum is thus unexpected. Its connection to the main vesicle is not clear.

***Lepidapedon hancocki*, new species**

(Plate 35, fig. 26)

Hosts: *Mycteroperca olfax* (Jenyns) (type host)

Mycteroperca xenarcha Jordan

A large, spotted grouper; unidentified

Location: Intestine

Locality: All hosts were from the Galapagos Islands
(Albemarle and James islands)

Number: From one to 15 in a host

SPECIFIC DIAGNOSIS OF LEPIDAPEDON HANCOCKI

Body flattened, spined, elongated, widest in its middle third, tapering anteriorly, more bluntly rounded posteriorly; length 1.458 to 3.997; width 0.553 to 0.948. Oral sucker 0.157 to 0.255 in diameter; acetabulum 0.127 to 0.187 in diameter; sucker ratio about 4:3; forebody $\frac{1}{3}$ to $\frac{1}{4}$ body length. Prepharynx short; pharynx 0.090 to 0.136 long by 0.052 to 0.082 wide; esophagus muscular, slightly longer than pharynx; intestinal bifurcation about midway between the suckers; ceca narrow, ending blindly near posterior end of body. Genital pore sinistral, some distance anterior to acetabulum, not far from left cecum. Testes smooth, tandem, close together, wider than long, in posterior third of body. Posttesticular space 0.157 to 0.300. Cirrus sac clavate, extending almost halfway to ovary, with elongate seminal vesicle extending about half its length, large ovoid prostatic vesicle, a short and wide pars prostatica, few prostatic cells, and a muscular cirrus. External seminal vesicle a large, wide sinuous tube surrounded by a mass of gland cells, extending almost to ovary. Ovary ovoid, wider than long, smooth, a short distance anterior to testes; Mehlis' gland just anterior to ovary; flask-shaped seminal receptacle originating just anterior to ovary, extending along

side of ovary or even posterior to it. Uterus preovarian; metraterm long, sinuous, dorsal to acetabulum and to anterior half of cirrus sac. Vitellaria from mid-acetabular level to posterior end of body; dorsal, ventral, lateral, and partly median to ceca. Eggs thin shelled, 60 to 75 by 32 to 42 μ . Excretory vesicle extending to intestinal bifurcation.

Type host: *Mycteroperca xenarcha*

Comparisons. This species differs from all others in the genus, except *L. nicolli* Manter, 1935, in its very short esophagus. It is very similar in most other respects to *L. nicolli*, e.g. extent of vitellaria, size of eggs, position of testes, sucker ratio. It is not thought to be *L. nicolli* chiefly because in every specimen the external seminal vesicle reached to or nearly to the ovary, whereas in all 3 specimens of *L. nicolli* this organ only reached about halfway between acetabulum and ovary. Other differences shown by *L. hancocki* are: more anterior genital pore; longer, more sinuous metraterm; narrower forebody; and a constantly different shape of the internal seminal vesicle, which is small and spherical in *L. nicolli*.

The species is named in honor of Captain Allan Hancock.

L. hancocki occurred in each case with *Proisorhynchus pacificus*, and each collection of the latter was from a host infected with the former.

Lepidapedon nicolli Manter, 1934

Host: Unidentified, spotted grouper

Location: Ceca

Locality: Isabel Island, Mexico

Number: One specimen

Although but one specimen was collected, comparison with the description and with paratype specimens of *L. nicolli* makes its identification definite. It agrees in every detail of structure and size except for slight variation in that the seminal vesicle extends more than halfway to the ovary and the eggs reach only a size of 58 by 36 μ . However, the former character is more or less variable in the 3 specimens of *L. nicolli*, and additional egg measurements of *L. nicolli* show that its eggs may be as small as 56 by 35 μ . The most characteristic feature of the species is the position of the genital pore posterior to the anterior border of the acetabulum. The original description states the genital pore to be "at level of anterior border of ventral sucker or slightly posterior to this level." In the Pacific specimen and in one Atlantic specimen the pore is actually about opposite the middle of the acetabulum.

L. hancocki is a very similar species, but the genital pore is definitely anterior to the acetabulum.

Pseudolepidapedon balistis, new species

(Plate 35, fig. 27)

Host: *Balistes verres* (Gilbert and Starks)

Location: Intestine

Locality: James Island, Galapagos

Number: 2 specimens in one host

Yamaguti named the genus *Pseudolepidapedon* for a lepecreadid-like trematode, *P. paralichthydis*, from an unnamed Japanese fish. He included in it the *Lepodora* sp. of Kobayashi (1921), which he named *Pseudolepidapedon kobayashii*. Yamaguti distinguished the genus from *Lepidapedon* by its median genital pore, absence of a seminal receptacle, and the structure of the terminal genitalia. Absence of an external seminal vesicle and a modified anterior portion of the pharynx are other important differences from *Lepidapedon*.

The following species is placed in the genus *Pseudolepidapedon*, even although it seems to have a seminal receptacle, because it has a median genital pore, lacks an external seminal vesicle, has a similar pharynx and similar terminal genital ducts. An interesting character is the presence of what seem to be lymphatic vessels, here associated again with a modified pharynx as in *Apocreadium*, *Megasolena*, *Hapladena*, and other genera. The affinities of the genus are probably *Lepocreadid*, but there is considerable resemblance to *Acanthopsolus* Odhner.

SPECIFIC DIAGNOSIS OF PSEUDOLEPIDAPEDON BALISTIS

Body completely spined; with eye spots. Length 1.957 to 2.794; width 0.945 to 1.093; greatest width near posterior end; posterior end broadly rounded, anterior end more tapering; forebody 0.712 to 1.161 (extended); oral sucker 0.275 to 0.307; acetabulum 0.300 to 0.360 (only slightly larger than oral sucker); prepharynx 0.142 to 0.315; pharynx pyriform, anterior third modified with circular muscles forming a prepharyngeal ring; pharynx 0.232 to 0.277 long by 0.225 to 0.262 wide; esophagus very short; ceca wide, diverging laterally, then extending to near posterior end of body.

Genital pore median, immediately anterior to acetabulum. Testes ovoid, smooth or with slightly irregular contour, longest in a diagonal direction, sub tandem or slightly diagonal, close together, intercecal, in posterior half of body. Posttesticular space 0.285 to 0.465. Cirrus sac elongate, more or less divided by a narrowed region into a fairly wide anterior portion lying along the left anterior border of acetabulum and

a claviform posterior portion extending to the ovary and overlapping that organ slightly dorsally. The basal portion contains a wide convoluted seminal vesicle, the narrow portion a smaller less convoluted tube, and the anterior portion a sinuous ejaculatory duct. Tall cells of a prostatic vesicle are lacking; prostatic cells are present but few. The unspined, muscular ejaculatory duct opens into a spacious genital atrium at the tip of a large blunt papilla.

Ovary ovoid, unlobed, pretesticular, slightly to the right, just median to right cecum; Laurer's canal probably present; uterus to the left of ovary and preovarian, extending to left of acetabulum; a saclike seminal receptacle apparently present but sperm cells also in uterus. Metraterm narrow, straight, unspined, opening into atrium at base of male papilla; vitelline follicles large, from intestinal bifurcation to posterior end of body, dorsal, ventral, and lateral to ceca, confluent posterior to testes and dorsally between acetabulum and pharynx. Eggs thin shelled, almost colorless, 60 to 70 by 31 to 37 μ . Excretory vesicle extending to ovary. Sinuous lymphatic vessels present (probably four longitudinal vessels).

The name *balistis* is for the host.

Comparisons. This species differs from both the other two species in more anterior extent of the vitellaria, in diagonal testes, in dextral ovary, in more posterior extent of the cirrus sac, and in presence of a seminal receptacle. There is some question as to the exact nature of the seminal receptacle in *P. balistis*; in the specimen sectioned it seemed to contain one or two eggs, and in the total mount its connections could not be made out. It may be a saclike outpocketing of the uterus.

Until more is known of the lymphatic system in the 3 forms, this species should be considered only tentatively in the genus. The taxonomic status of the genus will be of some interest if all species are found to possess a lymphatic system. At present, the family connections appear to be with the Allocreadiidae (subfamily Lepocreadiinae). However, as has been stated, resemblance to *Acanthopsolus* should be noted. The chief conspicuous difference seems to be the unspined cirrus and metraterm, while in addition the body is stouter, the eggs smaller, and the pharynx probably different.

Pseudocreadium scaphosomum, new species

(Plate 35, figs. 28, 29)

Hosts: *Balistes polylepis* Steindachner (type host)

B. verres Gilbert and Starks

Location: Intestine

Localities: Socorro and Clarion islands, Mexico, (type locality)—in *B. polylepis*

Charles Island, Galapagos

Isabel Island, Mexico,—in *B. verres*

Number: Few to many present in 2 specimens of each host

SPECIFIC DIAGNOSIS OF PSEUDOCREADIUM SCAPHOSOMUM

Body flat and thin, subcircular, with very thin inrolled edges giving it a bowl-like appearance; edges (when flattened by pressure) more or less frilled; cuticula smooth except for a few spines seen near the anterior end of some specimens. Probably a few easily lost spines are normally present. The body may be somewhat longer than wide or wider than long; length 1.552 to 2.268; width (at midbody level) 1.620 to 2.078 (specimens from *B. verres* somewhat smaller). Oral sucker subterminal, subcircular, 0.112 to 0.165 in diameter; acetabulum just anterior to midbody, only slightly larger than oral sucker, 0.165 to 0.195 in diameter. Forebody 0.675 to 0.937. Pharynx 0.068 to 0.102 long by 0.058 to 0.097 wide; esophagus long and narrow, almost as long as pharynx; ceca conspicuous, undulating, diagonally diverging backward, then bowed, some distance from edges of body, tips converging and almost meeting before ending blindly well anterior to posterior end of body. The ceca thus arch around a central area containing most of the reproductive organs. Excretory pore dorsal, median, between tips of ceca; excretory vesicle extending, dorsal to uterus, to near acetabulum where it gives off an anterior and a posterior pair of tubules.

Genital pore slightly to the left, opposite posterior end of esophagus. Testes symmetrical, immediately posterior to acetabulum, smooth or slightly irregular in outline, intercecal, separated by ovary. Cirrus sac (fig. 29) large, claviform, extending from genital pore diagonally backward, overlapping anterior half of acetabulum. In its base is a small, transversely extended, ovoid seminal vesicle followed by a large bipartite prostatic vesicle. Posterior portion of prostatic vesicle larger and more elongate, connected by a posteriorly directed, narrow duct with the more spherical anterior portion. Basal portion of cirrus papillated, filling most of the anterior half of the sac, making one backward loop, anterior portion smooth, muscular. Genital atrium short. External seminal vesicle present, short, tubular, little coiled. Prostate gland large, entirely external, surrounding most of cirrus sac. Ovary more or less lobed, median, intertesticular, immediately postacetabular. Vitellaria of small follicles

copiously distributed on both sides of ceca but not covering them dorsally or ventrally, not extending to edges of body by some distance. Seminal receptacle elongate, along left side of acetabulum. Uterus extending backward in narrow, median coils to level of excretory pore, then forward to metraterm; metraterm large, muscular, overlapping acetabulum. Eggs thin shelled, usually 51 to 56 by 32 to 44 μ , but in one specimen up to 66 μ in length, and in another as narrow as 26 μ .

The name *scaphosomum* is from scapho (=bowl) and *somum* (=body), and refers to the shape of the body.

Discussion. The specimens collected from *Balistes verres* are thought to represent the same species, although they are smaller (0.937 to 1.36 in length, as compared with 1.552 to 2.268 in the other collections). In them, too, more variation was found in the quantity of vitelline follicles which seemed partly exhausted in some specimens. Some of these specimens showed the uterus not reaching the posterior border of the testes, and in one case it was almost wholly anterior to the ovary. However, sucker ratio, egg size, and the internal structure of the cirrus sac agree with material from *B. polylepis*.

A consideration of the above species together with the following species leads the writer to conclude that *Hypocreadium* Ozaki, 1936 should be considered a synonym of *Pseudocreadium* Layman, 1930. Yamaguti (1938) has already shown that *Leptocreadium* Ozaki, 1936 is a synonym of *Pseudocreadium*. The possible generic distinction between *Pseudocreadium* and *Hypocreadium* would be based on the following characters of *Hypocreadium* (which apparently differs in *Pseudocreadium*): smooth cuticula, unlobed ovary, and uterus reaching posterior to the testes. The variable nature of these characters is revealed by (1) the fact that some specimens of *P. scaphosomum* show a few spines in the cuticula; (2) the fact that in the following species the ovary may be smooth or considerably lobed; and (3) that in certain specimens of *P. scaphosomum* the uterus may not reach beyond the testes.

The following species are known: *P. monacanthi* Layman, 1930 (synonym: *Leptocreadium skrjabini* Ozaki, 1936); *P. vitellosum* (Ozaki, 1936) Yamaguti, 1938; *P. symmetrorchis* (Ozaki, 1936) n. comb.; *P. patellare* (Yamaguti, 1938) n. comb.; and the 2 species described in the present paper.

P. scaphosomum is most similar to *P. patellare*. In *P. patellare*, however, the eggs are larger (63 to 81 by 33 to 43 μ), the ovary smooth, the ceca less undulating, and the prostatic vesicle is undivided and the cirrus

straight. *P. symmetrorchis* is different in body shape, sucker ratio, more posterior testes, and unlobed ovary. *P. monocanthi* has a more lobed ovary, more anterior uterus, and smoother testes.

***Pseudocreadium spinosum*, new species**

(Plate 35, figs. 30, 31)

Host: *Caulolatilus* sp. (whitefish)

Location: Intestine

Locality: James Island, Galapagos

Number: Large numbers were collected from a single host. In the same fish were *Lecithochirium microstomum* and *Choanodera caulolatilii*.

SPECIFIC DIAGNOSIS OF PSEUDOCREADIUM SPINOSUM

Sides of the thin, flattened body are curled over ventrally especially along the lateral edges and sometimes to a lesser degree along the posterior edge. If flattened out, the body would be as wide as long or even wider, but this condition is rarely seen. Length 0.592 to 1.053. A specimen 0.510 long contained no eggs. Body width measurements (0.562 to 1.053) are usually not precise because of the ventral folding of the lateral edges. Both ends are broadly rounded; anterior end likely to be more truncate. Spines conspicuous in anterior half of body and extend posteriorly almost to the end of the body. Suckers weakly muscular. Oral sucker circular, subterminal, a short distance from anterior end, 0.071 to 0.116 in diameter; acetabulum near middle of body or slightly anterior to middle, circular or subcircular, 0.107 to 0.168. Sucker ratio approximately 3:4. Forebody slightly more than $\frac{1}{3}$ body length. Prepharynx wide; pharynx globular (0.042 to 0.068 in diameter); esophagus short. Ceca unbranched, not undulating, curving backward distant from sides of body, passing closely outside testes and curving a short distance medianly just posterior to testes, ending blindly. Ceca very inconspicuous and partly covered by vitellaria. Genital pore to left of midline about midway between suckers, opposite or just median to left cecum. Testes symmetrical, just posterior to acetabulum, intercecal, separated by ovary and uterus, longer than wide with the long axis extending diagonally backward, outline smooth to definitely lobed. Cirrus sac elongate, clavate, large, extending from genital pore diagonally backward to overlap the right half of acetabulum. In a 1.012 specimen the cirrus sac was 0.310 by 0.088. It contains a subtriangular seminal vesicle, a bipartite prostatic

vesicle the posterior $\frac{2}{3}$ of which is usually recurved, the anterior $\frac{1}{3}$ globular; cirrus large, straight, wide, inflated, filling approximately $\frac{1}{2}$ cirrus sac, with papillated inner surface, tapering to a short smooth muscular portion near genital pore. The few prostatic cells are external to cirrus sac near its base. Tubular external seminal vesicle extends to left of base of cirrus sac usually overlapping the acetabulum.

Ovary variable in shape, usually irregularly lobed and elongate; it may be smooth and almost globular. A roughly triangular form is not uncommon. Seminal receptacle an elongate tube extending anterior to ovary along left side of acetabulum. The uterus may extend as far posterior as the posterior edge of the testes. Eggs few, yellow, thin shelled, 60 to 75 by 32 to 41 μ , usually 60 to 65 by 34 to 37 μ . Metraterm strongly muscular, slender, slightly curved, overlapping acetabulum. Vitelline follicles profuse, filling most of body from pharynx to posterior end, contiguous anteriorly and dorsally at level of esophagus and, if body is contracted, as far forward as the oral sucker. They are dorsal to the ceca as well as inter- and extracecal. They usually are not contiguous posteriorly but separated by a region around the excretory pore. They do not extend to the lateral edges of the body. Excretory pore conspicuous, dorsal, some distance anterior to posterior end, between the tips of the ceca; excretory vesicle extending straight forward to the ovary.

Comparisons. *P. monacanthi* and *P. vitellosum* differ from *P. spinosum* in larger size, in multilobed ovaries, and in smooth rounded testes. *P. monacanthi* also differs in that its suckers are of equal size and the vitelline lobes are separated anteriorly. *P. vitellosum* has more profuse vitellaria, diagonal testes close together and postovarian, suckers of equal size, and smaller eggs. *P. scaphosomum* has the vitellaria interrupted anteriorly, more undulating ceca, and a curved or coiled cirrus. *P. symmetrorchis* is larger, has more rounded seminal receptacle, vitellaria interrupted anteriorly, and more posterior extent of the uterus. *P. patellare* has a different distribution of the vitellaria, more anterior genital pore, longer cirrus, and more posterior extent of the uterus.

Anisoporus eucinostomi, new species

(Plate 36, figs. 32, 33)

Hosts: *Eucinostomus californiensis* (Gill) (type host)

Polynemus approximans Lay and Bennett

Location: Intestine

Localities: Port Utria, Colombia (type locality)
Bahia Honda, Panama

Number: 5 specimens from *E. californiensis*
One specimen from *P. approximans*

SPECIFIC DIAGNOSIS OF ANISOPORUS EUCINOSTOMI

Body smooth, tapering at each end but almost equally wide along most of its length, widest posterior to acetabulum; length 1.222 to 2.497; width 0.345 to 0.465. Forebody narrow, from $\frac{1}{5}$ to $\frac{1}{7}$ total body length. Oral sucker longer than wide, 0.109 to 0.144 in transverse diameter; acetabulum protuberant, each lip with 3 prominent lobelike papillae, length of acetabulum 0.144 to 0.210; sucker ratio probably about 2:3. A conspicuous accessory sucker, ventral, median or submedian, directly anterior to acetabular stalk, between acetabulum and genital pore. Accessory sucker with distinct pore and radiating muscles but lacking an outer membrane. Genital pore slightly to the left opposite base of pharynx.

Short prepharynx; pharynx 0.064 to 0.110 in length by 0.049 to 0.085 wide; esophagus muscular, 0.119 to 0.136 long, bifurcating dorsal to acetabulum; ceca unite near posterior end of body; anus near posterior tip of body.

Testes tandem, close together, in posterior half of hindbody, transversely extended, reaching almost to sides of body; posttesticular space sometimes longer, sometimes shorter than forebody. Cirrus sac lacking; cirrus short; prostatic cells few; seminal vesicle sinuous, extending to intestinal bifurcation or rarely as far as posterior edge of acetabulum. Ovary subtriangular, transversely extended, median, immediately pretesticular. Uterus largely intercecal, entirely preovarian; eggs 41 to 48 by 25 to 29 μ ; no seminal receptacle. Vitelline follicles large, from near base of acetabular stalk to posterior end of body except for a short interruption opposite posterior testis and sometimes opposite anterior testis; ventral, dorsal, and lateral to ceca; filling posttesticular area. Excretory pore terminal or dorsoterminal, close to anus; anterior extent of excretory vesicle not determined.

Discussion. The genus *Anisoporus* was named by Ozaki in 1928 (Ozaki, 1928a). *A. cobraeformis*, the type, is the only other species described to date.

Anisoporus is very closely related to *Opecoeloides* Odhner, 1928. *Opecoeloides* was based on *Distomum furcatum* Brems. It possesses an accessory sucker between the acetabulum and the genital pore, and has 6

tentacles on the acetabulum. It agrees with *Anisoporus* except that the ceca open into the excretory vesicle rather than to the outside. *Genitocotyle* Park, 1937 is also a related genus. *Genitocotyle* has the accessory sucker but no tentacles on the acetabulum, and apparently its ceca end blindly. There is considerable doubt if either of these characters should be of generic rank (for example, the acetabular processes are not considered generic in *Opecoelus*, and the uroproct is not emphasized in the genus *Stephanostomum*). *Anisoporus*, *Opecoeloides*, and *Genitocotyle* should all be considered to be in the subfamily *Opecoelinae*.

A. eucinostomi is very different from *A. cobraeformis* in shape of the forebody, in location of the accessory sucker which is median rather than lateral, in lacking a genital sucker, in more anterior extent of the vitellaria, and in longer esophagus.

***Anisoporus thyrinopsi*, new species**

(Plate 36, fig. 34)

Host: *Thyrinops pachylepis* (Günther)

Location: Intestine

Locality: Port Utria, Colombia

Number: One specimen in one of 10 hosts

SPECIFIC DIAGNOSIS OF ANISOPORUS THYRINOPSI

Body slender, widest at acetabular level, 1.538 by 0.307; forebody 0.412. Oral sucker longer than wide, 0.120 in transverse diameter; acetabulum 0.195 in diameter, with three pairs of papillae. Genital pore to the left, opposite base of pharynx. Accessory sucker to the left, midway between genital pore and acetabulum. Short prepharynx; pharynx 0.097 long by 0.048 wide; esophagus 0.135 long; intestinal bifurcation at anterior edge of acetabulum. Testes small, smooth, longer than wide, tandem, separated by a short distance; posttesticular space about $\frac{1}{3}$ body length. Cirrus short; pars prostatica long but with few cells; seminal vesicle sinuous, extending almost halfway between acetabulum and ovary. Ovary subspherical; vitellaria from posterior edge of acetabulum to posterior end of body; eggs 41 to 46 by 28 to 29 μ .

The name *thyrinopsi* is for the host. Being based on a single specimen, this species is named more or less tentatively.

Comparisons. This species is most like *A. eucinostomi*. It differs in more slender body, more tapering hindbody, shape of testes, and much longer seminal vesicle.

Dactylostomum vitellosum, new species

(Plate 36, fig. 35)

Host: Small, silver tide-pool fish

Location: Intestine

Locality: Gorgona Island, Colombia

Number: One specimen

SPECIFIC DIAGNOSIS OF DACTYLOSTOMUM VITELLOSUM

Body elongate, smooth, 1.755 by 0.352, widest at about midbody, bluntly rounded posteriorly. Forebody 0.285. Oral sucker 0.119 long; acetabulum 0.180 long, with transverse aperture, each lip of aperture (fig. 35) with 3 large rounded median lobes and 6 small papillalike elevations, 3 on each side. Prepharynx very short; pharynx 0.060 long, 0.076 thick; esophagus shorter than pharynx; ceca uniting near posterior end of body, but an anus is apparently lacking. Genital pore median, about midway between suckers. Testes tandem, approximately in midbody, somewhat separated by vitellaria, unlobed but slightly irregular in outline, somewhat extended transversely; posttesticular space 0.607. Cirrus sac very weak (possibly absent), enclosing only the short cirrus; seminal vesicle tubular, almost straight, free in parenchyma, extending backward to near posterior end of acetabulum. Ovary roughly three lobed or heart shaped, median, immediately anterior to testes. Vitelline follicles from anterior border of acetabulum to posterior end of body, chiefly lateral, confluent between and behind testes; yolk reservoir at dorsoanterior border of ovary; seminal receptacle lacking; uterus preovarian; eggs 53 to 54 by 27 to 30 μ .

Discussion. The genus *Dactylostomum* was named by Woolcock in 1935 and considered to be in the subfamily Coitocoecinae. The type species is *D. gracile* from *Myxus elongatus*, Port Philip Bay, Victoria. Considering the difference in host and locality, the present species is remarkably similar to *D. gracile*. It is smaller (1.755 as compared with 2.5 to 5.0), there is less difference in the sizes of the 2 suckers, the vitellaria are more profusely developed but have about the same distribution, the pharynx is larger, the eggs are smaller (53 to 54 μ as compared with 70 to 80 μ), the posttesticular space is longer. The smaller papillae of the acetabulum were not evident in *D. gracile*, but the extended condition of the sucker may have resulted in their reduction.

Woolcock compared *Dactylostomum* with *Coitocaecum*. The form of the acetabulum suggests *Opecoelus* and *Opegaster*. Actually, the genus

Dactylostomum differs from the so-called "Opecoelinae" only in the absence of an anus. The character of the terminal sex ducts and the character of the acetabulum are exactly as in some species of *Opegaster* and *Opecoelus*.

The presence or absence of an anus is sometimes difficult to determine. In fact, it can be said for *D. vitellosum* that an anus is almost present. Study of the toto-mount could not determine this character with certainty. It was thought probable that an inconspicuous anus was present. The posterior end of the worm was cut into serial cross sections 7.5 μ thick. These sections show that the posterior part of the united ceca approaches very close to the ventral surface of the body and comes in direct contact with the cuticula. The cuticula even seems to be thin at this spot, but no connection to the outside could be seen. It was finally decided that an anus was lacking. If an anus should be present in this species, it would become a member of the genus *Opegaster* and very similar to *O. parapristipomatis*.

After studying examples of all the following genera the writer is convinced that *Opecoelus*, *Opegaster*, *Dactylostomum*, *Coitocaecum*, and *Opecoelina* are rather closely related genera and should be classified in the same subfamily, *Opecoelinae*.

OPECOELUS and OPEGASTER

The genera *Opecoelus* Ozaki, 1925 and *Opegaster* Ozaki, 1928 are very similar. In *Opegaster* the vitellaria, or at least "rudimentary vitellaria," extend anterior to the acetabulum, while in *Opecoelus* the vitellaria are postacetabular. In *Opegaster*, the seminal vesicle does not extend appreciably beyond the acetabulum as it does in *Opecoelus*. The acetabulum is often stalked in *Opecoelus*, but not in *Opegaster*. The presence or absence of papillae on the acetabulum has not been considered a generic character, and both conditions are to be found in different species of each genus.

Actually some species seem close to the border line between the 2 genera. Thus, *Opegaster tamori* has vitellaria barely anterior to the acetabulum and a seminal vesicle reaching halfway to the ovary. Furthermore, the "rudimentary vitellaria" might not be considered by some as vitellaria, in which case some species exhibit the vitellarian condition of *Opecoelus* and the cirrus-sac extent of *Opegaster*.

Opecoelus mexicanus, new species

(Plate 36, figs. 36, 37)

Hosts: *Paranthias furcifer* (Cuv. and Val.)*Lutianus viridis* (Val.)

Location: Ceca and intestine, once from the stomach

Locality: Clarion Island, Mexico. Here the trematodes were found in 3 of 4 *Paranthias* and in 2 of 3 *Lutianus*. They were not found in 9 *Paranthias furcifer* or in 3 *Lutianus viridis* from the Galapagos Islands.

Number: Present in small numbers in the above-mentioned infected hosts

SPECIFIC DIAGNOSIS OF OPECOELUS MEXICANUS

Body flattened, elongate, tapering at each end, 0.935 to 1.957 in length by 0.345 to 0.562 in greatest width. Oral sucker subcircular, 0.102 to 0.153 in diameter. Acetabulum about $\frac{1}{5}$ body length from anterior end, slightly wider than long, 0.189 to 0.255 in transverse diameter. Sucker ratio approximately 3:5. Aperture of acetabulum transverse, each lip bearing 3 fairly long, pointed, median, fingerlike papillae and 2 lateral rudimentary papillae, one on each side. Pharynx large, pyriform, elongate, often widest in its anterior half, measuring 0.071 to 0.110 in length by 0.053 to 0.085 in greatest width; esophagus varying according to contraction (from 0.020 to 0.068), when extended it is more than half pharynx length; intestinal bifurcation a short distance anterior to acetabulum; the narrow ceca extend to near posterior end of body where they unite to form a short rectum; anus ventral, a little in front of posterior end of body. Genital pore slightly to left of midline, opposite middle or the base of pharynx. The small cirrus sac surrounds only the cylindrical cirrus and a few gland cells. It reaches approximately to intestinal bifurcation. From it a narrow male tube leads backward, gradually enlarging to form the elongate, almost straight, seminal vesicle extending dorsal to the right half of acetabulum and posterior to acetabulum a short distance. Testes just posterior to midbody, tandem, close together, wider than long, smooth, or slightly lobed; posttesticular space approximately $\frac{1}{3}$ body length.

Ovary immediately pretesticular, wider than long, somewhat heart shaped (sometimes of irregular outline). Vitellaria extending lateral to ceca from posterior edge of acetabulum to posterior end of body, not meeting posterior to anus; 2 longitudinal fields of follicles in posttesticular space. In one specimen the anterior extent was almost to mid-acetabular

level. Eggs thin shelled, 48 to 61 by 26 to 34 μ , averaging 53 by 27 μ . Excretory vesicle extending dorsal to testes to level of ovary. Type host: *Paranthias furcifer*.

Comparisons. This species differs from *O. inimici* Yamaguti, 1934 in its rudimentary lateral acetabular papillae, its more anterior genital pore, smaller eggs, wider testes, arrangement of posttesticular vitellaria, and sucker ratio. *O. goniistii* Yamaguti, 1938 also has 5 pairs of papillae but differs in many respects such as location of genital pore, shape of testes, extent of vitellaria, and seminal vesicle.

Opecoelus xenistii, new species

(Plates 36 and 37, figs. 38, 39)

Host: *Xenistius californiensis* (Steindachner)

Location: Intestine

Locality: Tagus Cove, Albemarle Island, Galapagos

Number: 7

SPECIFIC DIAGNOSIS OF OPECOELUS XENISTII

Size 1.552 to 2.356 by 0.675 to 0.780. Widest posterior to midbody; posterior end broadly rounded. Forebody $\frac{1}{5}$ to $\frac{1}{7}$ body length. Oral sucker 0.157 to 0.193 in transverse diameter; acetabulum 0.292 to 0.330 in diameter or slightly less than twice size of oral sucker; acetabulum with transverse aperture and 5 pairs of papillae. The 3 median papillae more prominent, lateral papillae very inconspicuous (fig. 39). Short prepharynx; pharynx 0.076 to 0.100 by 0.076 to 0.100; esophagus as long as pharynx or shorter; rectum short; anus conspicuous, a short distance anterior to posterior end of body. Genital pore conspicuous, with radiating muscles, slightly to the left, opposite base of pharynx. Testes large, tandem, just posterior to midbody, transversely extended, close together, with lateral edges bent dorsally and posterior borders deeply indented. Posttesticular space about $\frac{1}{3}$ body length. Seminal vesicle almost straight, extending slightly posterior to acetabulum. Cirrus sac enclosing only the cirrus and a few gland cells. Ovary immediately pretesticular, extended transversely, 3-lobed. Vitellaria close together, from near anterior border of acetabulum to near posterior end of body, filling posttesticular space, not meeting posterior to anus. Metraterm muscular, extending to acetabulum. Eggs 50 to 59 by 29 to 34 μ , usually about 54 by 32 μ . Excretory pore terminal or slightly dorsal. Excretory vesicle extending, dorsal to testes, as far forward as ovary.

Comparisons. The constant deep median cleft of the posterior margin of each testis is one of the most distinguishing characters of this species. Most species of *Opecoelus* have 3 pairs of labial processes. *Opecoelus mexicanus* is very similar in form of acetabulum, body form and size, and egg size, but differs in that the 3 pairs of median labial processes are longer; the vitellaria do not extend quite so far anterior; the genital pore is opposite the middle of the pharynx; the testes rather than being indented medianly are extended at that point; the ovary is not so deeply lobed, and the pharynx is longer in comparison with its width. *Opegaster tamori* has similar testes but no acetabular papillae and a more posterior genital pore.

***Opecoelus inimici* Yamaguti, 1934**

(Plate 37, fig. 40)

Host: *Paralabrax nebulifer* (Girard)

Location: Intestine

Locality: Cerros Island, Mexico

Number: Several

These specimens seem to agree in all important specific characters with Yamaguti's description of *O. inimici*, e.g. location of gonads, vitellaria, genital pore. Most measurements overlap those of the Japanese species, although the eggs (54 to 63 by 27 to 34 μ) are slightly smaller.

It seems to the writer that *O. Sebastodis* Yamaguti, 1934 is a synonym of *O. minor* Yamaguti, 1934. Measurements of the two overlap. Yamaguti separated the two on the character of the acetabular processes which were 0.075 long in *O. Sebastodis* as compared with 0.118 in *O. minor*. But Yamaguti states (p. 347) that the 0.118 is the length when extended and that "these appendages are variable in length according to contraction." Individual variation in the location of the opening of Laurer's canal is unknown. The vitellaria seem to reach somewhat more forward in *O. Sebastodis*, but this character is somewhat variable in my own collections of *Opecoelus* species. *O. Sebastodis* is here considered a synonym of *O. minor*.

***Opegaster acuta*, new species**

(Plate 37, fig. 41)

Host: *Abudefduf saxatilis* (Linn.)

Location: Intestine

Locality: Socorro Island, Mexico

Number: 12 specimens in one host, 9 in 3 others

SPECIFIC DIAGNOSIS OF OPEGASTER ACUTA

Body elongate, little flattened, almost cylindrical, widest at acetabular level, tapering toward each end, usually rather sharply pointed at posterior end; 0.950 to 1.633 in length, 0.307 to 0.427 in width. Forebody 0.187 to 0.382 or about $\frac{1}{4}$ body length. Oral sucker usually longer than wide, 0.120 to 0.150 in width by 0.135 to 0.150 in length. Acetabulum wider than long, with transverse aperture; nonpedunculated; 0.210 to 0.232 in diameter; sucker ratio approximately 3:5. Acetabulum with 5 pairs of small, simple, interlocking papillae. Prepharynx short and wide; pharynx 0.085 to 0.110 long by 0.060 to 0.102 wide; esophagus short and wide; intestinal bifurcation about midway between suckers; ceca unite near posterior end to form a short rectum (of somewhat variable length up to 0.102); anus ventral, subterminal, close to excretory pore. Genital pore median, opposite posterior edge of oral sucker. Testes subglobular (may be wider than long or longer than wide, the posterior testis being usually more elongate), tandem, close together, immediately posterior to midbody, intercecal, smooth. Cirrus sac very small, inconspicuous, surrounding only the cirrus, not extending posterior to pharynx. Seminal vesicle a sinuous tube lying free in parenchyma from level of intestinal bifurcation to about middle of acetabulum, connected with the cirrus sac by a thin-walled uncoiled tube. Prostate gland apparently lacking but perhaps represented by large nuclei in region of seminal vesicle. Ovary median, immediately pretesticular, either subtriangular and unlobed or distinctly trilobed; yolk reservoir to left of ovary; seminal receptacle lacking, sperm cells in uterus; Laurer's canal present; uterus preovarian; eggs yellow, thin shelled, blunter at one end, 44 to 49 by 24 to 27 μ (in balsam mounts). Vitelline follicles filling sides of hindbody; confluent posterior to testes; dorsal, ventral, and lateral to ceca; may overlap testes dorsally; extending anterior to acetabulum almost to intestinal bifurcation on one or both sides. In one specimen (fig. 41) only rudimentary follicles could be seen anterior to acetabulum. Excretory vesicle extending forward to ovary.

Comparisons. *Opegaster acuta* differs from all other species in the genus in the location of the genital pore, which is much more anterior. Most species do not have as many as 5 pairs of acetabular papillae. *O. acuta* differs from *O. tamori* in extent of the seminal vesicle, in shape of testes, in egg size, and in length of esophagus.

Opegaster pentedactyla, new species

(Plate 37, fig. 42)

Host: *Balistes verres* Gilbert and Starks

Location: Intestine

Locality: Charles Island, Galapagos

Number: 4 to numerous specimens in each of 2 hosts

SPECIFIC DIAGNOSIS OF OPEGASTER PENTEDACTYLA

A contracted specimen measured 0.918 by 0.450; 3 more extended specimens measured 1.360 to 1.424 by 0.337 to 0.450. Body widest at acetabular level, tapering toward each end but more pointed at posterior end. Forebody about $\frac{1}{4}$ total body length. Oral sucker 0.119 to 0.144 in diameter; acetabulum not markedly protuberant, wider than long, 0.178 to 0.247 in transverse diameter, with transverse aperture. Sucker ratio approximately 2:3. Acetabular lips each with 5 short papillalike interlocking tentacles. (In the type specimen there seem to be only 4 tentacles on the posterior lip, but the fifth might have been compressed by its anterior mate.) Prepharynx short; pharynx large, 0.087 to 0.110 in length by 0.085 to 0.105 in width. It may be wider than long, longer than wide, or of about equal dimensions. Esophagus shorter than pharynx in all 4 specimens. Possibly, when fully extended it might be as long as or even slightly longer than the pharynx. Rectum short; anus a short distance anterior to posterior end of body. Genital pore submedian, to the left, at level of posterior end of pharynx. Cirrus extending to or almost to the end of the esophagus; cirrus sac, if present at all, very delicate and enclosing only the cirrus; seminal vesicle with 2 curves, widening as it extends posteriorly, reaching to posterior edge of acetabulum; definite prostate gland lacking but probably represented by a few isolated gland cells near seminal vesicle opposite anterior edge of acetabulum. Testes ovoid, smooth or with slightly irregular contour, tandem, intercecal, close together or, at least, not far apart, in posterior half of body. A vas efferens arises dorsally from near anterior end of each testis and unites with its mate to form a short vas deferens near the seminal vesicle. The posttesticular space varies from only 0.187 in the contracted specimen to 0.425. Ovary indistinctly 3-lobed, heart shaped, the anterolateral lobes being more evident; shell gland dorsal at anterior border of ovary; seminal receptacle lacking; Laurer's canal present; uterus preovarian, extending along the medial side of the narrowed seminal vesicle, opening at the common genital pore from the anterior side; eggs 46 to 50 by 26 to 29 μ ; vitellaria extending

from posterior edge of acetabulum to posterior end, not confluent between testes, often overlapping the ceca ventrally but not dorsally. Colorless cellular structures the same size and shape of vitellaria in forebody ("rudimentary vitellaria"). Excretory pore subterminal, slightly dorsal; excretory vesicle a straight tube extending to level of ovary.

Comparisons. This species is probably most similar to *Opegaster acuta*. Two constant differences are: more posterior genital pore in *O. pentadactyla* and more anterior anus in *O. acuta*. *Opecoelus xenistii* has very similar acetabular papillae and terminal genital organs. Actually, although named in a different genus, *O. xenistii* is possibly identical with *Opegaster pentadactyla*. The difficulties in separating the genera have been mentioned above. *Opegaster pentadactyla* is considered distinct from *Opecoelus xenistii* because of more constant "rudimentary vitellaria," smaller size, considerably larger pharynx, slightly smaller eggs, and smooth testes.

A number of specimens secured from a fish (*B. verres*), which died in the ship's tanks, showed some variations probably due to their macerated condition. They are slightly longer, more slender, with longer prepharynx and esophagus, less conspicuous acetabular processes. One specimen seemed to have but 3 acetabular processes. Because of agreement with *O. pentadactyla* in other respects, the specimens were identified as that species.

Opegaster parapristipomatis Yamaguti, 1934

(Plate 37, fig. 43)

Hosts: *Trachinotus rhodopus* (Gill)

Selar crumenophthalmus (Bloch)

Location: Intestine

Locality: Chatham Island, Galapagos

Number: 6 in one, 15 in another of 2 hosts

The differences between these trematodes and *O. parapristipomatis* are considered too small to justify a new species. These differences are as follows: my specimens (1.200 to 1.790 in length) are somewhat smaller than the Japanese species which is 2.5 to 2.8 in length. The vitelline follicles are somewhat larger and in the forebody extend farther median than is shown in Yamaguti's figure. Eggs are somewhat smaller, 48 to 54 by 26 to 30 μ as compared with 57 to 70 by 31 to 42 μ . Most details are in agreement, e.g. the sucker ratio, the large pharynx, the length of the esophagus, the position of the genital pore, the extent of the vitellaria, ex-

tent of the seminal vesicle, and location of intestinal bifurcation. In most of my specimens the testes were considerably extended transversely, but this character was variable and some specimens were much like Yamaguti's in this character. Although most specimens showed 3 large and 2 small lateral papillae on each lip of the acetabulum, a few showed these structures inconspicuously, thus agreeing with Yamaguti's description of "inconspicuous papillae." The seminal vesicle may barely overreach the acetabulum, or it may extend to the posterior edge. The anus is practically terminal and opens with the excretory vesicle into a common terminal depression.

Two specimens of a trematode from *Selar crumenophthalmus* from Bahia Honda are almost certainly the same species or at least the same species as that from the Galapagos. They accidentally became dried but were mounted and agreed in all characters above except for more rounded testes.

Coitocaecum tropicum, new species

(Plate 37, figs. 44, 45)

<i>Host</i>	<i>Locality</i>	<i>Number</i>
<i>Halichoeres dispilus</i> (Günther) (type host)	Charles Island, Galapagos (type locality)	2
<i>Bathygobius soporator</i> (Cuv. and Val.)	Socorro Island, Mexico	1
<i>Bathygobius soporator</i>	Charles Island, Galapagos	6
<i>Malacoctenus zonifer</i> (Jordan and Gilbert)	Corrientes Bay, Colombia	2
Blenny	Charles Island	3
<i>Opisthognathus scops</i> (Jenkins and Everman)	Galapagos Islands	4

Location: Intestine

SPECIFIC DIAGNOSIS OF COITOCAECUM TROPICUM

Body smooth, elongate, flattened, rather abruptly pointed at posterior end, forebody more gradually narrowing. Length 0.780 to 1.140; greatest width (just posterior to acetabulum) 0.277 to 0.465; forebody usually about $\frac{1}{3}$ body length, 0.227 to 0.427 in length. Oral sucker slightly longer than wide, 0.088 to 0.135 wide; acetabulum wider than long, 0.165 to 0.277 in width, with transverse aperture. Sucker ratio approximately 1:2 (more often the acetabulum is a little less than twice the diameter of oral sucker). Prepharynx short and wide; pharynx globular or

subglobular, 0.059 to 0.087 long by 0.056 to 0.071 wide; esophagus about same length as pharynx, its anterior portion muscular and thick walled; intestinal bifurcation about midway between suckers; ceca uniting not far from posterior end; anus lacking. Genital pore to the left, opposite anterior half of esophagus. Testes tandem, or very slightly oblique, close together, smooth, wider than long, in posterior half of body. Testes were lacking in both specimens from *Malacoctenus zonifer*. Seminal vesicle tubular, coiled between acetabulum and intestinal bifurcation, only slightly overlapping acetabulum. (In one specimen from *Bathygobius* what seemed to be the seminal vesicle extended slightly posterior to the acetabulum.) Cirrus sac thin walled, between pore and left cecum which it overlaps but does not overreach, containing a sinuous ductus ejaculatorius and delicate cirrus (fig. 45). The narrowing seminal vesicle apparently not constricted as it enters the cirrus sac. Ovary small, ovoid, wider than long, to the right (sometimes median), close in front of anterior testis; seminal receptacle lacking; uterus pretesticular, may overlap left cecum slightly; metraterm thin walled, not quite so long as cirrus sac; eggs 48 to 51 by 26 to 32 μ . Vitellaria from intestinal bifurcation or esophagus region in sides of body to posterior end, lateral to ceca in anterior half of body, then, beginning at level of ovary, ventral and lateral to ceca, contiguous behind testes and behind cecal union. Excretory vesicle to level of ovary.

The name *tropicum* refers to the tropical distribution of this species.

Comparisons. Of the 10 species named in the genus *Coitocaecum*, the following 8 have vitellaria anterior to acetabulum; *C. anaspidis* Hickman, 1934; *C. diplobulbosum* Ozaki, 1929; *C. latum* Ozaki, 1929; *C. macrostomum* Pigulewski, 1931; *C. orthorchis* Ozaki, 1926; *C. ovatum* Pigulewski, 1931; *C. plagiorchis* Ozaki, 1926; *C. unibulbosum* Ozaki, 1929. In Ozaki's 1929 key to species, *C. tropicum* keys to *C. orthorchis*, while in Hickman's 1934 key it keys to *C. anaspidis*. *C. orthorchis* is re-described and figured by Yamaguti, 1938. *C. tropicum* differs from it in much smaller size, much smaller eggs, somewhat more anterior genital pore, somewhat smaller cirrus sac, and entirely lateral vitellaria in the forebody. It differs from *C. anaspidis* in smaller size, much smaller eggs, more tandem testes (perhaps a variable character), relatively larger pharynx, and entirely lateral vitellaria in the forebody. All 3 species are remarkably alike when one considers the differences in hosts and localities.

Discussion. Reference should be made here to the collections from blennies at Charles Island and from *Opisthognathus scops* from the same

region. These are tentatively considered as *C. tropicum*. Agreement is fairly complete (even to the exact distribution of the vitellaria), but whether an anus was lacking or not was not certain. Apparently there was no anus, and these specimens fit the above description in all essentials. The posttesticular portion of the body seemed longer and more flat.

***Opecoelina pacifica*, new species**

(Plate 38, figs. 46, 47)

Host: *Paralabrax* species (?)

Location: Intestine and ceca

Locality: Albemarle Island, Galapagos

Number: 15 from a single host

SPECIFIC DIAGNOSIS OF OPECOELINA PACIFICA

Body smooth, flattened, elongated, tapering to a rounded point at each end, 1.404 to 2.130 in length, 0.607 to 0.945 in width, widest near acetabulum. Oral sucker 0.157 to 0.217 in transverse diameter; acetabulum 0.330 to 0.465 in transverse diameter, without papillae; sucker ratio approximately 1:2. Pharynx 0.082 to 0.112 by 0.067 to 0.087; esophagus about same length as pharynx; intestinal bifurcation about midway between suckers; rectum short; anus terminal or subterminal, immediately ventral to excretory pore. Genital pore well to the left (halfway or more toward the left side of the body), varying from a level opposite base of esophagus to opposite base of pharynx. Testes tandem, close together, in posterior half of body, ovoid, slightly wider than long, smooth or (more often) slightly lobed, a median indentation being common. Cirrus sac well developed with a long slender cirrus portion which widens abruptly to form a swollen posterior portion containing a sinuous, narrow, tubular internal seminal vesicle and prostatic cells (fig. 47). Cirrus often protruded. Posterior portion of cirrus sac overlapping acetabulum at least slightly, usually about to its middle, sometimes to its posterior edge. External seminal vesicle a wide tube, bent once near its middle; its anterior part extending diagonally to the left, its posterior part extending diagonally to the right; extending posteriorly to level of ovary or perhaps only halfway from acetabulum to ovary; connected to cirrus sac by a slender, almost straight, somewhat sinuous tube.

Ovary 3- or 4-lobed, immediately pretesticular. Uterus, Mehlis' gland, yolk reservoir, Laurer's canal, and seminal receptacle preovarian.

Seminal receptacle a large, elongate sac, the posterior end of which may overlap ovary. Vitellaria from posterior end of pharynx to posterior end of body, interrupted opposite acetabulum, confluent or almost so dorsally anterior to acetabulum; in hindbody follicles are chiefly lateral, median, and ventral to ceca with very few dorsal follicles. Eggs yellow, thin-shelled, 54 to 68 by 31 to 36 μ . Excretory pore terminal immediately dorsal to anus; excretory vesicle extending dorsal to testes to level of ovary.

Comparisons. This species differs from all others in the genus (*O. scorpaenae* Manter, *O. helicoleni* Manter, *O. theragrae* Lloyd) in much more anterior extent of vitellaria. Other specific characters could be noted. The genus *Opecoelina* is to be separated from *Opecoelus* and *Opegaster* by the presence of a seminal receptacle.

Cymbephallus carangi Yamaguti, 1938

(Plate 38, figs. 48-50)

Host: *Selar crumenophthalmus* (Bloch)

Location: Intestine

Locality: La Plata Island, Ecuador

Number: 7 specimens in one host

These specimens agree with Yamaguti's description of *C. carangi* in all details except egg size, which was 42 to 54 by 26 to 31 μ rather than 60 to 72 by 33 to 35 μ . The acetabulum was not extended but a retracted peduncle is apparently present. Sometimes the acetabulum is pulled back into the body. There is agreement with Yamaguti's material in such details as sucker ratio, location of genital pore, size of pharynx and esophagus, shape of gonads, and distribution of vitellaria. The hosts are related.

Measurements on my material are: length 1.575 to 2.632; width 0.292 to 0.405; forebody about $\frac{1}{6}$ body length; oral sucker 0.142 to 0.195; acetabulum 0.150 to 0.195; ratio about 1:1. Eggs 42 to 54 by 26 to 31 μ , blunter at one end, without knob.

Parvacreadium bifidum, new genus, new species

(Plate 38, figs. 51-55)

Host: Identified only as a goby

Location: Intestine

Locality: James Island, Galapagos

Number: 5 specimens from a single host

SPECIFIC DIAGNOSIS OF PARVACREADIUM BIFIDUM

Body smooth, widest at posterior end, tapering from posterior to anterior end, more rapidly so anterior to acetabulum; posterior end truncated and deeply indented medianly to form 2 rounded lobes, right and left. These lobes may bear peculiar papillalike or fingerlike processes (seen on 2 specimens) (figs. 54 and 55). Body 0.817 to 0.953 in length by 0.360 to 0.450 in greatest width. Forebody narrow and thinner than remainder of body. Oral sucker subterminal, elongated, 0.076 to 0.099 in transverse diameter by 0.085 to 0.110 in length; acetabulum proper nearly circular, 0.127 to 0.178 in diameter, possessing a single large anterior lobe and a single large posterior lobe overlapping each other to cover the acetabular aperture (fig. 52). Edges of lobes with very thick cuticula; free edge of posterior lobe extending diagonally backward and outward beyond acetabulum (fig. 52). These large, peculiar acetabular lobes seem to have a grasping function.

Prepharynx possessing an inner circular fold forming a circular ridge, almost or quite meeting in the center (fig. 53); pharynx 0.060 to 0.071 long, 0.048 to 0.066 wide; esophagus somewhat shorter than pharynx; intestinal bifurcation about $\frac{2}{3}$ from anterior end of body to acetabulum; ceca reaching almost to posterior end, ending blindly. Genital pore slightly to the left, opposite base of pharynx or as far forward as mid-pharynx level. Testes tandem, close together, in posterior half of body, wider than long, slightly irregular in outline. Seminal vesicle slightly coiled, free in parenchyma, at anterior border of acetabulum which it may overlap a short distance; ejaculatory tube nonmuscular, almost straight, uniting with uterus near genital pore; genital sinus very short, thick walled; few prostatic cells scattered in region of ejaculatory tube and also near end of uterus. A delicate, rudimentary cirrus sac, continuous with the wall of the sinus, extends a very short distance backward enclosing a few gland cells and a weakly developed cirrus (cirrus sac observed only in sections).

Ovary transversely ovoid, pretesticular, to the right, close to anterior testis; seminal receptacle lacking; Laurer's canal present but apparently not opening to outside; vitellaria from intestinal bifurcation to posterior end of body, surrounding ceca in hindbody; uterus preovarian; eggs large and thin shelled, 51 to 59 by 30 to 34 μ . Excretory pore median, terminal, between posterior lobes of body; excretory vesicle narrow, extending to posterior testis.

GENERIC DIAGNOSIS OF PARVACREADIUM

Allocreadiinae of small size, with smooth skin. Acetabulum with a single large anterior and a similar posterior lobe. Posterior end broad and truncated, usually bilobed, or of very irregular contour. Prepharynx with internal thickening. Genital pore near pharynx. Seminal vesicle coiled, not reaching posterior to acetabulum. Genital sinus very short. Cirrus sac rudimentary. Cirrus weak. Seminal receptacle lacking. Type species: *Parvacreadium bifidum*.

The generic name is from *parva* (= small) and *creadium* and indicates a small, creadium-like trematode. The specific name *bifidum* indicates the bifid posterior end.

Discussion. Because the cirrus sac of this trematode is so inconspicuous, the genus might be thought related to the Anallocreadiinae. Actually, it differs from that subfamily in lacking body spines and a seminal receptacle as well as in the presence of a delicate but definite cirrus sac. *Parvacreadium* is probably most closely related to *Cymbephallus* Linton, 1934. *Cymbephallus* also has a very weak and small cirrus sac, a smooth cuticula, and, like *Parvacreadium*, a uterine seminal receptacle. Furthermore, certain *Cymbephallus* species possess acetabular processes. *Parvacreadium* differs from *Cymbephallus* in shape of the body, small size, the large acetabular lobes, the far anterior seminal vesicle, and reduced cirrus.

***Bianium adplicatum*, new species**

(Plate 39, figs. 56, 57)

Hosts and Localities:

Cheilichthys annulatus (Jenyns) from Albemarle and Charles islands, Galapagos, and San Francisco, Ecuador

Spheroides angusticeps (Jenyns) from Charles Island, Galapagos

Location: Intestine

Number: One to several in 5 hosts

SPECIFIC DIAGNOSIS OF BIANIUM ADPLICATUM

Length 1.58 to 2.43; greatest width 0.73 to 1.08; anterior half of body flattened with inrolled edges making it scoop shaped; ventrolateral folds extending a short distance posterior to acetabulum where they may turn medianly but do not unite; posterior half of body more or less cylindrical; body spined anteriorly, spines disappearing on hindbody; both ends of body broadly rounded, anterior end subtruncate. Oral sucker circular

or subcircular, 0.187 to 0.315 in diameter; acetabulum a short distance anterior to midbody, circular, 0.195 to 0.300 in diameter. Suckers subequal, oral sucker usually slightly larger. Short prepharynx present; pharynx 0.142 to 0.225 in length, 0.135 to 0.270 in width, with anterior border of eight lobes (fig. 57). These pharyngeal lobes are more marked ventrally and internally, the dorsal lobes being broader and not so clearly demarked. Esophagus short; ceca broad; 2 ani present. Genital pore to the left immediately anterior to acetabulum. Testes usually smooth, rarely slightly lobed, tandem or oblique, near hind end of body. Cirrus sac pyriform, extending from genital pore well past posterior edge of acetabulum; 0.390 to 0.555 long by 0.127 to 0.180 greatest width; containing a cirrus (extending approximately to posterior edge of acetabulum), a wide pars prostatica, an ovoid internal seminal vesicle. External seminal vesicle present. Ovary multilobed, median, immediately anterior to anterior testis; seminal receptacle elongate, extending along left side of anterior testis; uterus chiefly or wholly preovarian, wholly pretesticular; metraterm extending somewhat posterior to acetabulum. Vitellaria from near posterior edge of acetabulum to posterior end of body, lateral, dorsal, and ventral to ceca. Eggs 56 to 61 by 29 to 36 μ . Excretory pore at posterior end of body; excretory vesicle extending at least to ovary.

The name *adplicatum* indicates similarity to *B. plicatum*.

Comparisons. *B. adplicatum* is very similar to *B. plicatum* (Linton) except for the following differences: the oral sucker is larger, the pharynx is larger and possesses a lobed anterior border, the eggs are smaller, and the genital pore tends to be slightly more anterior. The lobed anterior border of the pharynx suggests the Megaperidae Manter, 1934, which also possesses anal pores.

B. cryptostoma (Ozaki) is very similar to *B. plicatum*, apparently differing only in the union of the body folds and absence of a prepharynx. Egg sizes were not given for *B. cryptostoma*, which may be a synonym of *B. plicatum*.

All species of *Bianium* to date occur in puffers.

***Myzotus vitellosus*, new genus, new species**

(Plate 39, figs. 58-60)

Host: *Caulolatilus* sp. probably *princeps* (Jenyns)

Location: Intestine

Locality: Tagus Cove, Albemarle Island, Galapagos

Number: Many from a single host

SPECIFIC DIAGNOSIS OF MYZOTUS VITELLOSUS

Body rather thick, elongated, rounded at each end, almost equally wide, 3.172 to 5.130 in length, 0.958 to 1.755 in greatest width. Cuticula smooth, very thick, and often thrown into folds, striated perpendicularly. Oral sucker subcircular, slightly wider than long, near anterior end, 0.277 to 0.435 in transverse diameter. Acetabulum about $\frac{1}{3}$ body length from anterior end, apparently circular, 0.562 to 1.040 in diameter; sucker ratio about 1:2. Body wall on each side of acetabulum prolonged to form 2 pairs of flaplike muscular lobes or flaps (fig. 59) of very irregular outline. Each anterior flap more or less tapering to a free, rounded point. Each posterior lobe more or less separated from the anterior lobe by an indentation. Size and shape of posterior lobe variable. Acetabulum deeply embedded in body, typical except near its small aperture where there occurs a group of circular muscles (fig. 60) more conspicuous in the posterior lip. A peculiar group of longitudinal muscles (fig. 60) in ventral posterior wall of acetabulum near the aperture.

Prepharynx very short; pharynx of about equal length and width, 0.180 to 0.337 in diameter; esophagus lacking; ceca broad, extending to posterior end of body, often slightly sinuous, ending blindly.

Testes tandem, smooth, close together, intercecal, wider than long, about in middle of hindbody, posterior testis often subtriangular, post-testicular space variable. Cirrus and cirrus sac lacking. Seminal vesicle an uncoiled tube, free in parenchyma, entirely dorsal to acetabulum, claviform and almost straight except for its curve around acetabulum. A short pars prostatica joins uterus at middle of anterior surface of acetabulum to form a fairly long genital sinus. Genital pore median at anterior edge of acetabulum, well buried within body folds. Prostatic cells around male tube and sinus.

Ovary smooth, ovoid, wider than long, median, not far anterior to anterior testis. Mehlis' gland very large, immediately preovarian. Seminal receptacle flask shaped, chiefly between ovary and anterior testis. Laurer's canal large and muscular. (In one sectioned specimen this canal was distended with sperm cells with heads directed toward the oötype indicating that Laurer's canal functions in copulation.) Uterus between ovary and acetabulum. Vitelline follicles large, filling most of body from middle of oral sucker to posterior end, confluent in forebody and also posterior to testes, dorsal, ventral, lateral, and median to ceca. Eggs thin shelled and variable in size. In four specimens, eggs were 61 to 68 by 31 to 39 μ , but in one 5.130 specimen they measured 95 by 42 μ .

Excretory pore terminal; excretory vesicle extending dorsal to hind testis, then ventral to anterior testis to end at level of ovary. A pair of anterior tubules on each side extends to anterior end of body and a pair of posterior tubules extends to near posterior end of body. No lymphatic vessels seen.

GENERIC DIAGNOSIS OF MYZOTUS

Anallocreadiinae. Body robust, cuticula thick, smooth, with two conspicuous bilobed flaps, one on each side of acetabulum. Gonads tandem, unlobed. Cirrus and cirrus sac lacking; genital sinus long; seminal vesicle simple, tubular, uncoiled. Mehlis' gland, Laurer's canal, and seminal receptacle large; vitellaria extensive. Lymph vessels lacking. Type species: *M. vitellosus*.

Discussion. This allocreadid genus can be referred to the Anallocreadiinae because of its lack of cirrus and cirrus sac and its possession of a tubular genital sinus. It is, however, very different from other genera not only in its peculiar acetabular lobes but in its smooth cuticula, thick body, and extensive vitellaria. Crassicutis Manter, 1936 with its practically smooth skin is perhaps a related genus, but its general appearance is very different, its body flattened and wide, its gonads of different location, its ceca narrow, and its acetabulum unmodified. The muscular modification of the acetabular lips of *Myzotus* is suggestive of *Myzoxenus* Manter, 1934 (see p. 299), but *Myzoxenus* lacks a genital sinus, has a cirrus sac, and is without acetabular flaps. *Myzotus* shows considerable resemblance to *Apocreadium* Manter, 1937 and *Choanodera* Manter (see p. 345), notably in the terminal genital tubes which are practically identical, in the histology of the oötype region with its huge Mehlis' gland and large Laurer's canal, and in its excretory system. Furthermore, *Choanodera* does possess ventral body folds which, however, involve the entire forebody. The similarity to *Choanodera* was so pronounced, especially in the reproductive systems, that one could expect to discover lymph vessels in *Myzotus*. Careful search reveals no trace of such vessels. Thus again it is indicated (see p. 348) that lymph vessels may be present or absent in related genera. In this paper, *Myzotus* is considered in the subfamily Anallocreadiinae.

The name *Myzotus* is from *myzo* (= sucker) and *otus* (= ear) and refers to the earlike flaps of the acetabulum. The name *vitellosus* refers to the extensive vitellaria.

Plagioporus gastrocotylus, new species

(Plate 39, figs. 61-63)

Host: *Calamus brachysomus* (Lockington)

Location: Intestine

Locality: Charles Island, Galapagos

Number: 7 specimens in one host

SPECIFIC DIAGNOSIS OF PLAGIOPORUS GASTROCOTYLUS

Body plump, smooth, fusiform, tapering toward each end from the wide acetabular region, greatest width more than half body length. Size 1.485 to 2.686 in length by 0.862 to 1.377 in greatest width. Oral sucker slightly extended at posterior end, slightly longer than wide, 0.232 to 0.352 in transverse diameter; acetabulum, located at about midbody, somewhat wider than long, with transverse aperture, 0.412 to 0.585 in transverse diameter. Sucker ratio almost 1:2. Ventral surface of widest portion of body almost wholly enclosed by a large circular fold of body wall which leaves an aperture opposite acetabulum of about the size of the acetabulum (figs. 62 and 63). Lateral portions of this fold not separated from body surface but anterior edge and often the posterior edge clearly demarked. (This curious overlapping sheet of the body wall is the most unique characteristic of the species.)

Prepharynx lacking; pharynx large, either wider than long or longer than wide, 0.165 to 0.292 in length, 0.150 to 0.285 in width; esophagus lacking or very short; intestinal bifurcation about midway between suckers; ceca wide, extending to near posterior end of body. Genital pore median or submedian, usually opposite middle of pharynx, sometimes opposite base of pharynx. Testes smooth, subspherical, close together, diagonal, intercecal, in middle of hindbody, anterior testis slightly sinistral, posttesticular space 0.090 to 0.270. Cirrus sac claviform, elongate, from genital pore to about midacetabular level; cirrus long and slightly sinuous; seminal vesicle internal, coiled, surrounded by prostatic cells. Ovary spherical, to the right, immediately posterior to acetabulum, overlapped by body fold; Mehlis' gland at anteroleft border of ovary; seminal receptacle large, partly dorsal and partly posterior to ovary; Laurer's canal present; uterus chiefly to left of ovary, extending backward to overlap anterior testis, reaching almost to anterior border of posterior testis. Eggs thin shelled, 63 to 68 by 32 to 37 μ . Vitellaria from mid-pharynx level to posterior end of body, surrounding ceca except on inner sides, confluent posterior to testes, not extending into ventral fold of body wall. Excretory vesicle extending forward to ovary.

The name *gastrocotylus* is from *gastro* (= ventral) and *cotyle* (= cup), and refers to the cuplike formation of the ventral body fold.

Comparisons. *P. gastrocotylus* differs from all other species in the genus in the circular body fold enclosing the region near the acetabulum. The median genital pore is not common in the genus. The fusiform shape and the diagonal testes occur also in *P. branchiostegi* Yamaguti, 1937, *P. alacris* (Looss), and *P. crassigula* (Linton). The two former species differ from *P. gastrocotylus* in position of genital pore, length of esophagus, and smaller size, as well as in other minor characters. *P. gastrocotylus* is without doubt most similar to *P. crassigula* collected from related hosts at Tortugas, Florida. Specimens of *P. crassigula* collected by the writer show the acetabulum somewhat sunk in the body and a muscular development of the peripheral region of the body wall suggesting the body fold of *P. gastrocotylus*. Both species have large pharynges and a very short or no esophagus. *P. gastrocotylus* is somewhat wider and more fusiform. Although Linton states that the genital pore of *P. crassigula* is near the acetabulum, in my specimens it may be as far forward as the base of the pharynx, thus corresponding to its possible position in *P. gastrocotylus*. It is, however, slightly more to the left in *P. crassigula*. The two species are enough alike so that they were thought for some time to represent the same species. They seem to form an example of a pair of "twin species."

Hamacreadium mutabile Linton, 1910

(Plate 40, fig. 64)

Hosts: *Lutianus viridis* (Val.)

Mycteroperca xenarcha Jordan (?)

Location: Intestine

Locality: Charles and Albemarle islands, Galapagos

Number: 3 from one *Lutianus*, 6 from *Mycteroperca* (?)

These specimens agree with *H. mutabile* Linton when the common but rather marked variations occurring within this species are considered. *H. mutabile* has been collected many times by the author at Tortugas, Florida, where it occurs in *Lutianus* and related hosts. The extent of the vitellaria is fairly constant. The follicles are confluent at the level of the intestinal bifurcation, especially dorsally, and extend approximately to mid-esophagus level. The lobing of the testes is highly variable and in a single collection of specimens may vary through all degrees from smooth to deeply lobed. The position of the genital pore is also variable. Usually

well to the left, opposite the edge of the left cecum, it is apparently median in some specimens, otherwise in perfect agreement with *H. mutabile*. Both of these variations are unusual within a species of trematode. In fact, one of the 3 specimens in the present lot shows a genital pore almost median in position. The cirrus sac extends to the left but bends back medianly near its tip. When the cirrus sac is straight, the genital pore is to the left.

These variations arouse some question as to the validity of *H. epinepheli* Yamaguti, 1934 and *H. lethrini* Yamaguti, 1934. Specimens of *H. epinepheli* kindly sent to me by Yamaguti show the dorsal preacetabular confluency of the vitellaria. But the genital pore is constantly median and *H. epinepheli* may be a valid species. *H. lethrini* differs in the anterior extent of the vitellaria.

The specimens from *Mycteroperca xenarcha* (?) (the identification of the host is somewhat uncertain) all agreed in showing a short, narrow, and pointed posterior region of the body; but, since other details agreed with *H. mutabile*, the pointed posterior end is interpreted as an individual variation.

The genus *Hamacreadium* is so similar to *Plagioporus* (= *Lebouria*) and to *Podocotyle* that its validity might be questioned. Yamaguti emphasizes the anterior extent of the excretory vesicle. The median genital pore, although not constant in *Hamacreadium*, is usual, whereas it is never median in *Plagioporus*. The ovary is always lobed in *Hamacreadium* and rarely so in *Plagioporus*. In *Podocotyle* the testes are tandem (possible exception—*P. atherinae* Nicoll), the excretory bladder not anterior to the acetabulum, the vitellaria not anterior to the acetabulum, the genital pore to the left.

***Hamacreadium oscitans* Linton, 1910**

Host: *Anisotremus interruptus* (Gill)

Location: Intestine

Locality: Sullivan Bay, James Island, Galapagos

Frequency: One specimen collected

Hamacreadium oscitans was described by Linton (1910) from Tortugas, Florida, from the following hosts: *Haemulon plumieri*, *H. sciurus*, and *Anisotremus virginicus*. The writer has collected it at Tortugas from *Anisotremus virginicus* and *A. carbonarium* (the latter a new host record).

Although only a single specimen was collected from the Galapagos Islands, it is in good condition and shows all the specific characters to be identical with the Atlantic species. For example, not only are all the organs identical in position, shape, and size, but the eggs are identical in size and shape and possess the characteristic tubercle at one pole. There seems no doubt as to the identification of the parasite.

There may be some doubt whether *H. oscitans* should be retained in the genus *Hamacreadium*. The median genital pore and the form and position of the testes and ovary would so indicate, but the vitellaria do not extend anterior to the acetabulum, and the excretory vesicle reaches only to the posterior fourth of the acetabulum. While Yamaguti (1934) considers the extension of the excretory vesicle anterior to the acetabulum a generic character, McCoy (1930) found it did not reach beyond the acetabulum in *H. gullela*. For the present, *H. oscitans* is retained in the genus *Hamacreadium*.

Podocotyle mecopera, new species

(Plate 40, fig. 65)

Host: Unidentified, spotted grouper

Location: Intestine

Locality: James Island, Galapagos

Number: 9 specimens from one host

This trematode fits the rather broad generic diagnosis of *Podocotyle* as given by Park (1937) except that the vitellaria do not reach to the region of the acetabulum. Another uncommon *Podocotyle* feature is the unlobed ovary. The species is, however, considered in the genus *Podocotyle*.

SPECIFIC DIAGNOSIS OF PODOCOTYLE MECOPERA

Body elongate, little flattened, subcylindrical, tapering toward each end, widest opposite acetabulum; length 1.849 to 2.538; width 0.517 to 0.600. Forebody short but usually contracted, 0.262 to 0.375 or $\frac{1}{6}$ to almost $\frac{1}{10}$ body length. Diameter oral sucker 0.157 to 0.188; acetabulum wider than long; transverse diameter 0.375 to 0.420, slightly more than twice diameter of oral sucker. Pharynx 0.102 to 0.144 long by 0.070 to 0.083; esophagus shorter than pharynx; bifurcation just anterior to acetabulum; ceca ending blindly near posterior end of body. Genital pore well to the left, opposite intestinal bifurcation. Testes large, rounded, smooth, tandem, close together but not quite touching, anterior testis

about in midbody. Posttesticular space 0.600 to 0.900. Cirrus sac with a long, slender, anterior portion extending from the pore diagonally backward to acetabulum then almost directly backward to posterior border of acetabulum where it may make a short coil or loop and joins a large, swollen, posterior portion. Seminal vesicle large and much coiled within the posterior portion of the sac, sinuous in the narrow portion; prostatic cells large and fairly numerous in the basal region of the sac. The cirrus sac reaches entirely or almost to the anterior edge of the ovary. Ovary globular, smooth, wider than long, slightly to the right, directly anterior to the anterior testis. Shell gland at the left posterior edge of ovary; seminal vesicle pyriform, dorsal to ovary. Vitelline follicles large, from anterior border of ovary to posterior end of body, dorsal, ventral, and lateral to ceca, uninterrupted, a few follicles dorsal to testes and ovary. Uterus preovarian; eggs thin shelled, variable, 70 to 83 by 32 to 48 μ , usually 73 to 82 by 36 to 46 μ . Excretory vesicle extending forward to the ovary; a pair of collecting tubules median to ceca between ovary and posterior end of body.

The specific name is from *meco* (= long) and *pera* (= pouch) and refers to the very long cirrus sac.

Comparisons. No other species of *Podocotyle* has the vitellaria terminating at the ovary. The peculiar shape and the far posterior extent of the cirrus sac are also unique. Although *P. pearsei* Manter, 1934 and *P. petalophallus* (Yamaguti, 1934) have only indistinctly lobed ovaries, *P. mecopera* is the only species with entirely smooth ovary.

***Podocotyle breviformis*, new species**

(Plate 40, figs. 66-68)

Host: *Anisotremus* (?) species

Location: Intestine

Locality: Tagus Cove, Albemarle Island, Galapagos

Number: 7 specimens from one host

SPECIFIC DIAGNOSIS OF *PODOCOTYLE BREVIFORMIS*

Body thick, subcylindrical, about 3 times longer than wide, 1.44 to 2.025 long by 0.510 to 0.675 in greatest width; forebody (in preserved specimens) $\frac{1}{4}$ to $\frac{1}{5}$ body length, tapering to oral sucker; hindbody tapering gradually to a rounded posterior end. Oral sucker circular, 0.210 to 0.270 in diameter; acetabulum wider than long, 0.382 to 0.520 in transverse diameter, with transverse aperture; sucker ratio approximately

1:2. Prepharynx very short; pharynx large, muscular, 0.130 to 0.170 long by 0.088 to 0.094 wide; esophagus short; intestinal bifurcation a short distance anterior to acetabulum; ceca wide, extending to near posterior end of body. Genital pore only slightly to left of midline, a short distance anterior to acetabulum, opposite left cecum, close to intestinal bifurcation. Testes smooth, rounded, diagonal, immediately posterior to midbody; posttesticular space 0.270 to 0.487. Cirrus sac clavate, extending diagonally in space between intestinal bifurcation and acetabulum, sometimes overlapping anterior border of acetabulum slightly or only reaching to acetabulum, containing a large, tubular, sinuous seminal vesicle, fairly well-developed prostatic cells, and a muscular, sinuous cirrus which extends approximately $\frac{1}{4}$ length of cirrus sac. Ovary very distinctly divided into rounded lobes which seem to be almost completely separated. Usually 3 lobes can be seen, but in one specimen there were 4, one of which perhaps represented the central body of the ovary; the other 3 lobes were chiefly posterior to it. Ovary located to right of anterior testis and may even overlap posterior testis; seminal receptacle spherical or ovoid, immediately anterior to ovary; vitellaria begin abruptly at level of posterior edge of acetabulum and extend, close together, dorsal, ventral, and lateral to ceca to posterior end of body; uterus preovarian but usually overlapping anterior testis; metraterm extending from genital pore to anterior edge of acetabulum; eggs thin shelled, almost rounded, almost colorless, without constant ribs or folds, sometimes truncate at one end, 36 to 43 by 26 to 32 μ . Excretory vesicle extending to slightly in front of ovary.

The name *breviformis* refers to the rather short body.

Comparisons. The Podocotyle species most similar to *P. breviformis* are *P. atherinae* Nicoll, *P. pearsei* Manter, *P. levinseni* Issaitschikov and *P. blennicottusi* Park. *P. breviformis* differs from *P. pearsei* in the shape and position of the ovary, in its much shorter esophagus, in location of the intestinal bifurcation, in its much shorter and wider eggs, and in posterior extent of cirrus sac. *P. levinseni* differs in shape and location of the ovary, the tandem position of the testes, the longer esophagus, and very much larger eggs (80 to 95 μ as compared with 36 to 43 μ). *P. breviformis* keys to *P. blennicottusi* in the key offered by Park (1937), but *P. blennicottusi* differs in shape and location of the ovary, in shape and location of the testes, in different posterior extent of the cirrus sac, in anterior extent of vitellaria, and in egg size. *P. breviformis* is most similar to *P. atherinae*, named by Nicoll (1914) as a species inquirenda. The two agree in body form, diagonal testes, and position of ovary but differ in

that *P. breviformis* has a much shorter cirrus sac not much more than reaching the acetabulum, a shorter esophagus, smaller and wider eggs, more tapering hindbody, and longer posttesticular space.

Discussion. Park (1937) has recently reviewed the genus *Podocotyle*. In view of his emphasis on the form of the seminal vesicle it might be stated here that in *P. pearsei* Manter, 1934 the seminal vesicle is largely a straight wide tube filling most of the cirrus sac but which after narrowing loops back a short distance and then becomes slightly sinuous. Thus, the species is correctly placed in Park's key under the head of "seminal vesicle sinuous." The distinction, however, between a "sinuous" and a "coiled" seminal vesicle might be difficult to determine. Park questioned the specific value of the length of the esophagus, extent of vitellaria, and size of eggs within this genus. Obviously, such characters should be carefully evaluated with some consideration given to degree of body contraction or extension. Single specimens may exhibit abnormal or unusual conditions which should not influence specific criteria too much. In general, the writer feels that length of esophagus, extent of vitellaria, and size of eggs are fairly reliable specific characters in this genus.

Park (1937a, p. 411) states that "size of eggs is the only reliable difference between *P. levinseni* (= the *P. levenseni* of Park, 1937) and *P. pearsei*, and then concludes that *P. pearsei* can scarcely be established as distinct from *P. levinseni*. While this conclusion may be correct, differences between the 2 forms include not only the size of the eggs but also the shape of the eggs and the anterior extent of the vitellaria (as used by Park in his key).

P. pacifica Park, 1937 seems to be very similar to the *P. atomon* of McFarlane, 1936 which was collected from a similar host from a neighboring region. The esophagus of the specimen drawn by McFarlane is short for *P. atomon*; yet the vitellaria are too continuous for *P. olssoni*. Collections of these 2 Pacific forms should be compared more fully.

Helicometra torta Linton, 1910

Host: *Epinephelus labriformis* (Jenyns)

Location: Intestine

Locality: Cape Elena, Ecuador

Number: 5 specimens in one host

These trematodes agree fully with *H. torta* in all fundamentals such as size, thin hindbody, sucker ratio, position of genital pore, aperture of

acetabulum, shape of gonads, extent of vitellaria, and size of eggs. There was a tendency for the vitellaria to reach slightly more than halfway from the ovary to the acetabulum, but in no case did they reach the acetabulum and in no case farther than has been observed in *H. torta*. It is of interest to note that the host is *Epinephelus*, the same genus as the hosts of this trematode at Tortugas, Florida.

***Helicometra sinuata* (Rud., 1819)**

Host: Moray

Location: Intestine

Locality: Port Culebra, Costa Rica

Number: One specimen from one host

This species is previously known only from Europe, where it occurs in *Trachinus draco* and *Ophidium imberbe* (= *Fierasfer imberbis*). Its occurrence in the Pacific is unexpected. Although only one specimen was collected, there can be little doubt as to its specific agreement with *H. sinuata*. The measurements are: length 2.29, width 0.75, forebody 0.49, oral sucker 0.18, acetabulum 0.26, eggs 46 to 53 by 19 μ . The body is elongate, broadly rounded posteriorly. The testes are not lobed, although not perfectly spherical. The posterior testis is subtriangular; the anterior testis is transversely extended. The vitellaria are distributed exactly as in *H. sinuata* and are interrupted opposite the acetabulum. Palombi (1929) has given a list of synonyms and a discussion of *H. sinuata*.

***Helicometra fasciata* (Rud., 1819)**

Hosts and Localities: Flounder from Tenacatita Bay, Mexico
Unidentified stargazer from Santa
Maria, Mexico

Location: Intestine

Number: One specimen from each of the above hosts

These specimens agree well with the characteristics of *H. fasciata* as limited by Palombi (1929). The specimen from the flounder is almost typical, but the one from the stargazer possessed somewhat oblique testes and rather large eggs.

***Helicometrina nimia* Linton, 1910**

(Plate 40, fig. 69)

Host: *Paralabrax nebulifer* (Girard)?, kelp bass

Location: Intestine

Locality: Cerros Island, Mexico

Number: 5 specimens

This species is a common trematode at Tortugas, Florida, where Manter (1933) has reported it from 14 different hosts. It has not been recorded elsewhere. Thus, this extension of a Gulf of Mexico form to the Pacific is of special interest. Until recently, only two *Helicometrina* species (*H. nimia* and *H. parva*) have been known, but Srivastava (1936) has described *H. septorchis* and *H. orientalis* from the Bay of Bengal.

Manter (1933) considered *Helicometrina azumae* Layman, 1930 in the genus *Rhagorchis* Manter, 1931; Yamaguti (1934) considered *H. azumae* in his new genus *Decemtestis*. The chief difference between *Rhagorchis* and *Decemtestis* seems to be the presence of an external seminal vesicle in the former. Since no external seminal vesicle was described for *H. azumae*, Yamaguti's disposition seems to be correct, and *Rhagorchis azumae* (Layman, 1930) Manter, 1933 becomes a synonym of *Decemtestis azumae* (Layman, 1930) Yamaguti, 1934.

Labrifer secundus, new species

(Plate 40, fig. 70)

Host: *Pimelometopon pulcher* (Ayres)

Location: Intestine

Locality: Cerros Island, Mexico

Number: One from a single host

This single specimen occurred with another trematode (*Lepocreadium bimarinum*). The posterior end was torn away or macerated but all other organs were clearly discernible. The unique structure of the acetabulum and the peculiar male genital organs very clearly indicate the genus *Labrifer* in which, to date, but one other species is known. Therefore, since generic and specific identification is easily possible, the species is described in spite of the small quantity of material.

SPECIFIC DIAGNOSIS OF LABRIFER SECUNDUS

Body smooth, with rapidly tapering forebody and rounded anterior end, pigment spots in forebody. Body fragment (probably nearly complete) 1.35 by 0.690 with greatest width at acetabular level. Oral sucker subterminal 0.150 in transverse diameter, with transverse aperture; acetabulum 0.412 in diameter, weak, deeply embedded in body, its aperture small, transverse, guarded by an anterior and posterior lip of homogeneous structure and by larger lips (anterior and posterior) with parallel

muscular bands (fig. 70). Anterior muscular lip 0.153 in diameter, posterior muscular lip 0.110 in diameter. Prepharynx lacking; pharynx 0.940 long by 0.110 wide; esophagus short; very wide ceca. Genital pore slightly to the left at posterior end of pharynx. Testes subspherical, smooth, tandem, close together, in posterior half of body. Cirrus sac muscular, thick walled; spindle shaped with anterior narrow portion bent ventrally, posterior portion (dorsal to acetabulum) narrowing almost to a point, containing in basal portion a broad, tubular, internal seminal vesicle, in middle portion a spherical prostatic vesicle, and terminally a muscular cirrus. A narrow seminal tube widens opposite posterior fourth of acetabulum to form a broad, tubular, external seminal vesicle ending at anterior border of ovary. Just posterior to acetabulum, dorsally on each side occurs a group of gland cells interpreted by Yamaguti in *L. semicossyphi* as prostatic cells. Male system almost exactly as in *L. semicossyphi* except for greater coiling of external seminal vesicle. Ovary subspherical, smooth, at right anterior border of anterior testis not far posterior to acetabulum; seminal receptacle flask shaped, lying transversely and dorsally across posterior half of ovary; yolk reservoir to left of ovary; uterus pre-ovarian; eggs 58 to 60 by 26 to 31 μ ; vitelline follicles from level of intestinal bifurcation backwards, lateral to and anterior to acetabulum they are ventral to ceca, but posterior to that level they surround the ceca. Excretory system not seen.

The name *secundus* indicates the second-named species in the genus.

Comparisons. This species differs from *L. semicossyphi* chiefly in the more anterior extent of the vitellaria. Since Yamaguti had numerous specimens of *L. semicossyphi* in which the vitellaria usually did not reach the acetabulum and never beyond its posterior border, this character can be considered specific. Other minor differences seen in *L. secundus* seem to be: less conspicuous acetabulum, shorter uterus, coiled external seminal vesicle, and wider ceca.

Discussion. The very close resemblance of this species to *L. semicossyphi* at once suggested a comparison of the hosts involved. These fishes do prove to be related, both being in the family Labridae. The trematodes, however, are more similar than the hosts, presumably, since the parasites can scarcely be distinguished specifically while the fishes are in different genera. The indicated interhost connections, therefore, are Pacific rather than Atlantic. *L. semicossyphi* is from the Inland Sea, Japan.

There can be no doubt that *Labrifer* is related to the genus *Myzoxenus* Manter, 1934. Both possess similar muscular lips on the acetab-

ulum and both possess a very muscular cirrus sac and a tubular external seminal vesicle. In *Myzoxenus*, however, the acetabular lips are lateral in position rather than anterior and posterior. It might be noted that the two species of *Myzoxenus* are both from related fishes in the Atlantic. *M. vitellosus* Manter, 1934 is from *Decodon puellaris* and (in 2 of 14) *Calamus calamus*. The other species of *Myzoxenus* (as yet undescribed) is from *Lachnolaimus maximus*. All of these genera of fishes with the exception of *Calamus* are Labridae.

ACANTHOCOLPIDAE Lühe, 1909

Stephanostomum megacephalum, new species

(Plate 41, figs. 71-74)

Host: *Caranx hippos* (Linnaeus)

Location: 6 specimens from the gills, one specimen from the intestine

Localities: Bahia Honda, Panama (type locality)
San Francisco, Ecuador
White Friars, Mexico

Number: 7 specimens from one host, one each from 2 others

SPECIFIC DIAGNOSIS OF STEPHANOSTOMUM MEGACEPHALUM (Based on 7 specimens)

Length 1.431 to 2.212; greatest width 0.375 to 0.465. Forebody $\frac{1}{3}$ to $\frac{1}{4}$ total body length; posttesticular space $\frac{1}{8}$ to $\frac{1}{10}$ total body length. Oral sucker 0.165 to 0.206 in diameter; acetabulum 0.165 to 0.195 in diameter; sucker ratio varying from about equal to 5:4. Oral spines in two rows, interrupted by a short space in midventral line; 30 to 32 in number, almost always 32. The two pairs of spines immediately adjacent to the midline space are smaller than the others, measuring 0.051 to 0.068 in length by 0.012 to 0.014 in width. The spines reach maximum size laterally and dorsally, measuring 0.085 to 0.100 by 0.015 to 0.019. Immediately posterior to the oral ring and opposite the oral sucker the skin is free of spines. Body spines very large on forebody; spination disappearing a short distance posterior to acetabulum, the posterior half of body apparently smooth. Prepharynx long; pharynx 0.187 to 0.262 in length by 0.088 to 0.114 in width, subcylindrical rather than markedly pyriform; esophagus short. Prepharynx may be less than, equal to, or more than pharynx length, according to state of contraction. Ceca ending close to excretory vesicle with which they may connect (this point not deter-

mined). Genital pore median, immediately preacetabular. Testes subglobular, not markedly longer than wide, of slightly irregular contour, close together, intercecal, in posterior fourth of body. Cirrus sac almost straight or bent at level of anterior end of seminal vesicle, extending from $\frac{1}{3}$ to $\frac{1}{2}$ the distance from acetabulum to ovary; cirrus spined, extending only slightly posterior to acetabulum; tubular genital atrium from pore to near midacetabular level. Ovary globular, median, closely anterior to anterior testis. Vitellaria from posterior end of cirrus sac to posterior end of body; continuous; dorsal, ventral, and lateral to ceca (follicles may not quite reach cirrus sac or may reach very slightly posterior to its posterior edge); no follicles directly between gonads; metraterm spined, considerably shorter than cirrus sac; eggs 60 to 71 by 32 to 42 μ .

Comparisons. Only two other species of *Stephanostomum* show the ventral interruption of the oral spines. These are *S. bicornatum* (Stossich) and *S. cesticillum* (Molin). *S. megacephalum* differs from both in its much smaller size, less extensive anterior extent of the vitellaria, shape of testes, smaller eggs, and shape of pharynx.

The name *megacephalum* refers to the large oral sucker.

Two specimens (figs. 71 and 74) of *Stephanostomum* from the same host, one from San Francisco, Ecuador, the other from White Friars, Mexico, were thought for a time to represent another species but are included as *S. megacephalum*. They are only slightly larger (up to 3.307); they have a sucker ratio of about 3:2 rather than 5:4; the testes are ovoid and rather definitely longer than wide; the genital atrium is short; the eggs 70 to 76 by 37 to 46 μ ; and the oral spines are somewhat larger. Other features such as number and arrangement of oral spines, location of gonads, extent of vitellaria, and extent of cirrus sac are the same. Since the degree of differences is small, it was decided that these specimens could be considered as *S. megacephalum*.

In a collection of *Stephanostomum* specimens from *Caranx latus* Agassiz at Tortugas, Florida, one specimen, somewhat macerated and not quite complete posteriorly, is identified as *S. megacephalum*. It agrees with the Pacific material in sucker ratio, oral spines (there seem to be only 30, but the count might be uncertain to that extent of difference, or the median pair may have been lost), extent of vitellaria, extent and shape of cirrus sac, egg size, and shape and position of the gonads. Other *Stephanostomum* in the same collection belong to other species, one of which is similar if not identical with the following species. These could not be identified, however, with any certainty because of loss of spines, unusual body extension, et cetera.

Discussion. The genus *Stephanostomum* was named by Looss in 1899. In accordance with the then accepted interpretation of the rules of nomenclature, Looss came to consider the name *Stephanostomum* unavailable because of the generic name *Stephanostoma* Danielsen, 1880, and in 1901 he renamed the trematode genus to *Stephanochasmus*. *Stephanochasmus* Looss, 1901 became the recognized name for the genus and has been and still is the most commonly used term.

However, a Recommendation under Article 36 of the International Rules of Zoological Nomenclature reads: "It is well to avoid the introduction of new generic names which differ from generic names already in use only in termination or in a slight variation in spelling which might lead to confusion. But when once introduced, such names are not to be rejected on this account." The first example cited is "*Picus*, *Pica*." In Opinion 25 of the International Commission it was voted 11 to 1 (3 not voting) that *Damesella*, 1905 should not be rejected because of the existence of *Damesiella*, 1898.

Following this Recommendation, the writer (Manter, 1934, p. 286) considered that *Stephanostomum* Looss, 1899 was "not to be rejected" on account of its similarity to *Stephanostoma*. However, recommendations of the International Commission are not mandatory, and some authorities might prefer to continue with the use of the name *Stephanochasmus*.

***Stephanostomum longisomum*, new species**

(Plate 41, figs. 75, 76)

Host: *Caranx hippos* (Linnaeus)

Location: Intestine

Localities: San Francisco, Ecuador

White Friars, Mexico (type locality)

Number: One specimen in each of 2 hosts examined. In both cases, *Stephanostomum megacephalum* was also present.

The following diagnosis is based on one complete specimen and one incomplete specimen lacking the forebody. The measurements (except egg size) are on the complete specimen, although the fragment showed similar proportions so far as could be seen.

SPECIFIC DIAGNOSIS OF STEPHANOSTOMUM LONGISOMUM

Length 7.627; width 0.540, most of hindbody about equally wide. Forebody 0.937 or about $\frac{1}{8}$ total body length; posttesticular space 0.802.

Body spination to about level of ovary with traces as far back as testes. Oral sucker 0.262 in diameter; acetabulum 0.397 in diameter; sucker ratio about 3:4.5; acetabulum with narrow transverse aperture. Oral spines 38 or 40 (probably 38—count uncertain), with 2 pairs of smaller spines in the midventral area. Smallest (midventral pair) 0.048 by 0.010; adjacent pair 0.051 by 0.012; largest spines (lateral and dorsal) 0.110 by 0.017. Prepharynx longer than pharynx; pharynx more or less pyriform, 0.300 long by 0.165 wide; short esophagus; ceca to near posterior end, probably uniting with excretory vesicle. Testes narrow and elongate, tandem, intercecal, in posterior third of body, close together and almost touching but separated by a very few vitelline follicles. Cirrus sac slender, slightly sinuous, extending about $\frac{1}{4}$ distance between acetabulum and ovary; cirrus short, spiny, opposite posterior half of acetabulum; genital atrium opposite anterior half of acetabulum; genital pore median at anterior edge of acetabulum. Ovary subtriangular and elongate, median, well anterior to testes from which it is separated by many vitellaria; uterus long but with narrow intercecal coils, uterine area (to metraterm) more than $\frac{1}{3}$ total body length. Metraterm considerably shorter than cirrus sac, ending at anterior level of seminal vesicle. Vitellaria abundant, dorsal, ventral, and lateral to ceca; ventral to uterus; continuous from posterior end of cirrus sac to posterior end of body, filling space between ovary and testes but barely meeting between testes. Eggs 60 to 65 by 31 to 37 μ .

The name *longisomum* refers to the very long hindbody which is 8 times the length of the forebody.

Comparisons. The presence of smaller oral spines in the midventral region groups this species with *S. bicoronatum*, *S. cesticillum*, and *S. megacephalum*, which are the only other species with ventrally interrupted rows of oral spines. It is distinctly different from *S. megacephalum* (collected from the same host) in body size and proportions, in sucker ratio, in number of oral spines, in shape of testes, and in position of the ovary in relation to the testes. It is more like *S. bicoronatum* and *S. cesticillum* in body size and body proportions, although its hindbody is relatively longer. It differs from both in the anterior extent of the vitellaria (which do not extend beyond the base of the cirrus sac), in posterior extent of the cirrus sac (which does not reach nearly so far toward the ovary), in smaller eggs, and in a slightly larger number of oral spines. The testes are closer together than in *S. cesticillum*; the ovary is more distant from the testes than in *S. bicoronatum*.

Stephanostomum casum (Linton, 1910)

Hosts and Localities: *Lutianus viridis* (Val.) from Albemarle Island, Galapagos

Lutianus jordani (Gilbert) ? from Secas Islands, Mexico

Lutianus novemfasciatus (Gill) ? from Tangola Tangola, Mexico

Location: Intestine

Number: One specimen from each of the above hosts

These specimens agreed in all details with *S. casum*. Identification is based on body form, sucker ratio, 36 oral spines, anterior extent of the vitellaria, location of gonads, extent of cirrus sac, and egg size.

This species is common at Tortugas, Florida, in *Lutianus analis* and *L. griseus* as well as occurring in other hosts. It has been reported from *Sebastes* sp. from British Columbia by McFarlane (1936). The writer (Manter, 1931) has reported it from *Micropogon undulatus* at Beaufort, North Carolina, but this record is incorrect. The Beaufort specimens are not *S. casum*. Yamaguti reports *S. casum* from *Pagrosomus auratus*, but, since he states that 46 oral spines occur, his form may be another species.

Stephanostomum multispinosum, new species

(Plate 41, figs. 77, 78)

Hosts: *Mycteroperca olfax* (Jenyns) (type host)
Mycteroperca sp. (perhaps *olfax*)

Location: Intestine

Locality: Albemarle Island, Galapagos (type locality)
Clarion Island, Mexico

Number: 2 specimens only were collected, one from Albemarle Island (in *M. olfax*), one from Clarion Island (in *Mycteroperca* sp.)

The following specific diagnosis is based on these two specimens.

SPECIFIC DIAGNOSIS OF STEPHANOSTOMUM MULTISPINOSUM

Length 2.754 to 2.929; width 0.615 to 0.787; forebody 0.570 to 0.675 or a little less than $\frac{1}{2}$ body length. Posttesticular distance 0.412 to 0.427 or about $\frac{1}{4}$ total body length. Oral sucker 0.180 to 0.187 in diameter; acetabulum 0.247 to 0.250 in diameter; sucker ratio about 3:4. Oral spines small, very numerous, in two rows, not sharply pointed; 38 to 40 pairs or a total of approximately 80 (the number may be the same in

both specimens, but accuracy in counting cannot be certain along the sides where the spines overlap several times); largest spines about 0.027 by 0.012; smallest spines about 0.017 by 0.007. Body spination extending to posterior end but denser anteriorly. Prepharynx not much longer than pharynx (shorter when forebody contracted); pharynx 0.195 to 0.228 long by 0.180 to 0.187 wide; distinctly pyriform; esophagus short; ceca obviously opening into excretory vesicle. Genital pore median close in front of acetabulum. Testes rounded, tandem, in posterior $\frac{1}{2}$ to $\frac{1}{3}$ of body; not markedly longer than wide, largely intercecal but partly overlapping the ceca ventrally; separated by a short distance which is not occupied by vitellaria except dorsally; cirrus sac sinuous, very long, reaching more than halfway between acetabulum and ovary, cirrus very long, reaching almost halfway to ovary; seminal vesicle in basal fourth or fifth of sac; genital atrium tubular, opposite anterior half of acetabulum. Ovary globular to subtriangular, not elongated, separated from anterior testis by a short space not occupied by vitellaria; vitellaria from posterior fourth or posterior edge of acetabulum to posterior end of body; continuous; not covering uterus; dorsal, ventral, and lateral to ceca but not entering between gonads except dorsally; eggs 68 to 82 by 38 to 44 μ , usually about 71 to 73 by 41 to 42 μ ; metraterm narrow, sinuous, almost as long as cirrus sac, and extending more than halfway to the ovary.

The name *multispinosum* refers to the large number of oral spines.

Comparisons. No other species of *Stephanostomum* has nearly so many oral spines as *S. multispinosum* with the exception of *S. microstephanum* and *S. tristephanum*, both of which have 3 rows instead of 2. The oral spines, furthermore, are smaller than in other species.

Stephanostomum hispidum (Yamaguti, 1934) n. comb.

(Plate 42, figs. 79, 80)

Synonym: *Echinostephanus hispidus* Yamaguti, 1934

Hosts and Localities: *Seriola dorsalis* (Gill) at Tangola Tangola, Mexico, and Secas Islands, Panama
Seriola species (not *dorsalis*) at White Friars, Mexico

Elagatis bipinnulatus (Quoy and Gaimard) at Bahia Honda, Panama

Location: Intestine

Number: 4 from *S. dorsalis*; 6 from *S. species*; 4 from *E. bipinnulatus*

Echinostephanus hispidus was collected by Yamaguti from *Seriola quinqueradiata* from Japan (Pacific Coast). Ward (1937, p. 517) pointed out that the genus *Echinostephanus* should be considered a synonym of *Stephanochasmus* (= *Stephanostomum*). There can be no doubt as to this synonymy.

An interesting but perplexing condition exists among the specimens from the 3 species of *Seriola* mentioned above. Specimens from any one of these species are remarkably similar but differ in small details from specimens collected from any of the other species of *Seriola*. One rather obvious solution, if the differences are not sufficient to warrant different species, is to consider that 3 subspecies or varieties exist. Certainly on the basis of available specimens (which include 4 specimens collected by Yamaguti and kindly sent to the writer), certain fairly constant but slight differences exist among the 3 collections. It was decided, however, not to give specific rank to each collection.

Figs. 79 and 80 show the form from *S. dorsalis*. In this form the suckers are usually subequal, but in one specimen the ratio was almost 3:4 (0.225 as compared with 0.277). The number of oral spines was 42 to 44 (possibly 46 in one specimen). The oral spines are noticeably smaller ventrally, and about 7 lateral spines on each side lie in a single row (fig. 80). This unusual arrangement was described by Yamaguti for *S. hispidum*. He states, "There are 42 spindle-shaped spines arranged dorsally and ventrally in two alternate rows, but laterally in a single row." His figures do not show this condition clearly, and specimens I have are somewhat macerated and without spines. Other characters of interest shown by the form from *S. dorsalis* are: long genital atrium extending posterior to the acetabulum, anterior limit of the vitellaria either at the base of the cirrus sac or as far forward as the anterior level of the seminal vesicle (about $\frac{1}{3}$ the length of the cirrus sac), and conspicuous metraterm almost as long as the cirrus sac.

Specimens from *Seriola* species agree in most respects. The oral spines are the same number (about 44), but the single lateral row is less evident and apparently not present in some if in any of the 6 specimens. The oral sucker is not equal to the acetabulum, the ratio being about 3:4 or even 2:3. This sucker ratio, however, is not much different from that shown by one specimen from *S. dorsalis*. The only other difference is that the ovary is separated from the testes by at least a few vitelline follicles. In this respect, the form resembles Yamaguti's specimens.

Yamaguti's form agrees well with the above except in two respects. The vitellaria extend slightly farther forward, reaching a level about opposite the middle of the cirrus sac; and the metraterm is inconspicuous and evidently thin walled. My specimens of Yamaguti's forms show the cirrus sac joining the metraterm posterior to the acetabulum so that the genital atrium is actually as long as in my material. The position of the ovary is like that in the form from *Seriola* species but unlike that in the form from *S. dorsalis*. The number and probably the arrangement of the oral spines, the sucker ratio, and the egg size probably differ only within the range of individual variation. All forms have a uroproct. The position of the ovary is usually constant, but, since one specimen showed it separated from the anterior testis by only a few vitelline follicles, it is not urged as a significant character here. The character which might most validly distinguish the Japanese form is the slightly more anterior extent of the vitellaria.

The specimens from *Elagatis* (a genus closely related to *Seriola*) are like those from *Seriola* species, although only 38 oral spines could be counted in one specimen.

***Stephanostomum anisotremi*, new species**

(Plate 42, figs. 81, 82)

Host: *Anisotremus scapularis* (Tschudi)

Location: Intestine

Locality: Tagus Cove, Albemarle Island, Galapagos

Number: 16 specimens from a single host

The following diagnosis is based chiefly on 4 specimens favorable for measurement. The other specimens were also studied and found to agree in all characters which could be determined. The cylindrical nature of the body often resulted in lateral views of total mounts. The oral spines had been partly lost in a few specimens. Two specimens (one broken) of another (undetermined) species with 32 oral spines and with vitellaria almost to the acetabulum occurred in the same collection.

SPECIFIC DIAGNOSIS OF STEPHANOSTOMUM ANISOTREMI

Length 2.808 to 3.874; width 0.450 to 0.532; body elongate and cylindrical. Body spination to level of posterior testis becoming sparse posteriorly. Forebody 0.652 to 0.810, about $\frac{1}{4}$ to $\frac{1}{5}$ total body length except when greatly extended, when it may be almost $\frac{1}{3}$ body length.

Posttesticular space 0.270 to 0.390. Oral sucker 0.142 to 0.165 in diameter; acetabulum 0.258 to 0.315 in diameter; sucker ratio almost 1:2 (about 4:7). Oral spines 40 (20 rows), possibly 38 in a few cases; all spines approximately the same size, anterior row slightly larger, posterior row extending beyond anterior row; largest spines 0.060 to 0.065 by 0.014 to 0.017; smallest spine 0.043 to 0.060 by 0.010 to 0.015. Prepharynx long; pharynx pyriform, 0.210 to 0.240 long by 0.102 to 0.145 wide; esophagus very short; intestinal bifurcation just anterior to acetabulum; uroproct probably present. Testes large, tandem, intercecal, close together, almost always in contact, rarely with a very few vitelline follicles between them; anterior testis globular or subglobular, almost as wide as long; posterior testis longer than wide. Cirrus sac slightly sinuous, extending about $\frac{1}{3}$ the distance from acetabulum to ovary, never as far as $\frac{1}{2}$; cirrus very long, often protruded from genital pore; genital atrium opposite anterior half of acetabulum. Ovary ovoid, wider than long, immediately anterior to anterior testis from which it is almost always separated by a very few vitelline follicles. Vitellaria from base of cirrus sac continuous to posterior end of body; dorsal, ventral, and lateral to ceca but not covering the uterus; eggs 60 to 68 by 27 to 41 μ ; metraterm weak, usually so filled with eggs as to be invisible.

Comparisons. This species is to be compared with those having complete rows of oral spines and with the vitellaria ending at or near the base of the cirrus sac. Of these, it is most like *S. sentum* (Linton) which is common in related hosts at Tortugas, Florida. Only three differences can be recognized: *S. anisotremi* has 40 oral spines rather than 36; it has a sucker ratio of 1:2 (or nearly 2) rather than $1\frac{1}{2}$; and the eggs are somewhat smaller (up to 68 μ rather than 75 to 85 μ or even more). These differences are not great, but after studying specimens of *S. sentum* from Florida, the writer believes they are sufficiently constant. *S. caducum* (Looss) has 48 oral spines, a sucker ratio of 1:1, and (at least usually) interrupted vitellaria. *S. minutum* (Looss) has 36 spines and smaller eggs.

In comparing species of *Stephanostomum*, the writer can find no significant differences between the descriptions of *S. imparspine* (Linton, 1905) n. comb. described from Beaufort, North Carolina, fishes and *S. sentum* (Linton, 1910) from Tortugas, Florida. Linton doubtless was dealing with more than one species in his records of "*Dist. imparspine*," one of which is probably identical with *S. sentum*.

Dihemistephanus brachyderus, new species

(Plate 43, figs. 83-86)

Hosts: *Oligoplites saurus* (Bloch and Schneider)*Caranx hippos* (Linn.) ?

Location: Intestine

Locality: San Francisco, Ecuador

Number: 8 specimens from 2 *O. saurus*; one specimen from *C. hippos*. In *C. hippos* it occurred with *Stephanostomum longisomum* and *S. megacephalum*

The genus *Dihemistephanus* was named by Looss in 1901. It is distinguished from the genus *Stephanostomum* chiefly because the oral spines are interrupted by a wide ventral space. The genus was more completely described by Little in 1930. Only 2 species are known to date: *S. lydiae* (Stoss.) Looss, the type, and *S. sturionis* Little.

There is some doubt that the present species belongs in *Dihemistephanus* rather than in a new genus. Divergences shown are the tendency for a dorsal as well as a ventral break in the rows of oral spines, the complicated folds of the oral sucker, and the thick-walled, convoluted excretory tubules. However, it seems evident that the dorsal break in the oral spines and also the shape of the oral sucker are variable characters.

SPECIFIC DIAGNOSIS OF DIHEMISTEPHANUS BRACHYDERUS

Length 2.632 to 6.480; width 0.315 to 0.652. Forebody 0.217 to 0.292, usually about $\frac{1}{20}$ body length but in one case about $\frac{1}{10}$ body length. Pigment flecks in forebody. Fine scalelike spines cover body as far back as ovary but are lacking on ventral surface of forebody. Oral sucker 0.120 to 0.262 in transverse diameter; acetabulum 0.150 to 0.285 in transverse diameter. The transverse diameters of the suckers may be equal, or the acetabulum may be slightly larger. Acetabulum always longer than wide, usually considerably so, ratio of width to length about 3:4. Acetabulum usually tapering posteriorly; somewhat protuberant and overlapping forebody. Oral sucker with crown of narrow spines alternating so closely that the shorter posterior row often seems to lie directly beneath anterior row; separated by a wide ventral space and usually by a shorter dorsal space. Spines, however, rather easily lost; number of spines about 50 to 60; smallest spines (ventral) about 20 to 27 by 5 to 6 μ ; largest spines (lateral) about 60 by 7 to 8 μ . Oral sucker with small longitudinal aperture, an anterior sometimes protuberant cone-shaped lobe, ventrolateral lobes, and two wider and thicker dorsolateral lobes (figs. 84 and 85). The appearance is usually that of an inner portion more or less pulled down into an outer portion (fig. 86 shows sections cut

through the aperture). Very short prepharynx; pharynx large, cylindrical, 0.109 to 0.178 in length by 0.076 to 0.093 in width, overlapping acetabulum. Esophagus very short or lacking; ceca extending to posterior end of body; uroproct present.

Genital pore in groove of forebody covered by acetabulum, hence inconspicuous. Testes smooth, ovoid, longer than wide, tandem in posterior half of body; separated by vitelline follicles. Cirrus sac very elongate, extending a little over halfway between acetabulum and ovary; containing a swollen, tubular, slightly sinuous, seminal vesicle occupying a little less than $\frac{1}{3}$ total length of cirrus sac, a slender glandular portion occupying a little more than the middle third, and a slender spiny cirrus occupying about the terminal third. Cirrus joins metraterm a short distance posterior to acetabulum. Ovary ovoid, wider than long, separated from anterior testis by a few vitelline follicles. Seminal receptacle present. Vitellaria from shortly anterior to seminal vesicle; dorsal, ventral, and lateral to ceca to posterior end of body; interrupted opposite ovary and testes; confluent between and behind gonads. Metraterm straight, spined, a little over half length of cirrus sac. Eggs yellow, 58 to 65 by 31 to 36 μ . Genital atrium a narrow muscular tube posterior to acetabulum, a wide muscular tube dorsal to acetabulum, becoming a very thin-walled narrow tube near the genital pore.

Unpaired excretory vesicle extending to level of anterior testis whence two small inconspicuous lateral tubes extend forward. These soon become paired (2 on each side of the body) but remain inconspicuous until about opposite the anterior end of the seminal vesicle. Here they become much coiled and with very thick, convoluted walls and are conspicuous even in total mounts. The outer (more lateral) pair becomes smaller and gradually disappears opposite the spiny portion of the cirrus; the median pair extends to the acetabulum and becomes thin walled and inconspicuous in the forebody, apparently ending near the oral sucker.

Discussion. Although some of the unusual characters of this species (e.g. the form of the oral sucker, the dorsal break in the oral spines) are variable, many distinctive features are very constant. It is very different from the other 2 species in the genus in its very short forebody, short prepharynx, number and relative sizes of the oral spines, distribution of the vitellaria, and length and shape of the genital atrium. The 2 pairs of anterior excretory tubes seem to be unlike the single-paired condition described for other species, and the thick convoluted walls of these vessels are also distinctive. A uroproct is not described for either of the other 2 species, but this character is very inconspicuous.

Haploplanchnidae Poche, 1926

Haploplanchnus acutus (Linton, 1910)

Hosts: *Tylosurus fodiator* Jordan and Gilbert
Kyphosus elegans (Peters) ?

Location: Intestine

Localities: Port Utria, Colombia
Charles Island, Galapagos

Number: 4 in *Tylosurus*; one in *Kyphosus*

This species has been recorded hitherto (by Linton, 1910 and Manter, 1937a) from *Tylosurus acus*, *T. marinus*, and *T. raphidoma* at Tortugas, Florida, and at Bermuda.

Haploplanchnus pomacentri Manter, 1937

Host: *Pomacentrus rectifraenum* Gill

Location: Intestine

Locality: Charles Island, Galapagos

Number: 2

This species is recorded by Manter, 1937a from *Pomacentrus leucostictus* and *P. xanthurus* at Tortugas, Florida. Its occurrence in a related yet shallow-water reef fish in the Galapagos is of some interest.

Monorchidae Odhner, 1911

Proctotrema longicaecum, new species

(Plate 44, figs. 87-89)

Host: *Anisotremus interruptus* (Gill)

Location: Intestine

Locality: James Island, Galapagos

Number: 2 specimens in one of 3 hosts examined

The following specific diagnosis is based on 2 specimens from the above locality and one specimen from *Anisotremus virginicus* (Linn.) from Tortugas, Florida. Specimens from both regions are figured (figs. 87 and 89), and differences are discussed below.

SPECIFIC DIAGNOSIS OF PROCTOTREMA LONGICAECUM

Body spined, elongate, 1.5 to 1.781 by 0.292 to 0.357, anterior end truncate, posterior end tapering slightly and rounded. Oral sucker termi-

nal, funnel shaped, longer than wide, length 0.240 to 0.314, width 0.202 to 0.272. Acetabulum about $\frac{1}{3}$ body length from anterior end, 0.107 to 0.126 in diameter or about half the transverse diameter of oral sucker. Prepharynx present, almost as long as pharynx, pharynx well developed, 0.117 to 0.130 long by 0.080 to 0.118 wide; esophagus not quite so long as pharynx; ceca extending to near posterior end of body. Genital pore median or submedian, a very short distance anterior to acetabulum. Testis large, ovoid, intercecal, directly posterior to midbody. (Two vasa efferentia could be seen arising from the anterior end of the testis in one specimen.) Cirrus sac elongate, curving around the right side of acetabulum or overlapping the right half of acetabulum, extending to the anterior edge of the ovary or even past the ovary to the anterior edge of the testis; containing a long-spined cirrus, pars prostatica, prostate gland, and, in its basal third, the ovoid seminal vesicle. Spines in the cirrus are of one type. Ovary ovoid, unlobed, immediately anterior to testis, to the right. Seminal receptacle, if present, rudimentary. Vitellaria of 9 large, distinct follicles on each side, lateral, just posterior to midbody at ovariotesticular level. Uterus chiefly intercecal, filling most of hindbody, entering the middle region of the metraterm sac. Metraterm sac elongate oval, to the left, extending a short distance posterior to the acetabulum, containing a large spherical vesicle in its base and an anterior spiny region. What seems to be a muscular terminal region is probably the genital atrium but is not demarked from the metraterm. Eggs 18 to 20 by 9 to 11 μ . The excretory system could not be made out.

Comparisons. This species is probably most closely related to *Proctotrema truncata* (Linton, 1910) n. comb.¹ (Synonym: *Genolopa truncata* Linton), but is clearly distinct in the following characters: more elongate body, much longer ceca, more slender cirrus sac, smaller ovary, more posterior vitellaria, larger acetabulum, and slightly larger eggs. *P. longicaecum* differs from *P. bacilliovatum* Odhner, 1911 in shape of eggs as well as in other characters; from *P. lintoni* Manter, 1931 in body form, size of oral sucker, extent of ceca, more posterior vitellaria, more slender cirrus sac, and shorter eggs. It differs from *P. plectorhynchi* Yamaguti, 1934 in shape of ovary, length of ceca, more slender cirrus sac, and smaller eggs. It differs from *P. macrorchis* Yamaguti, 1934 in longer ceca, shape and position of ovary, and smaller eggs.

¹ The removal of *Genolopa truncata* from the genus *Genolopa* leaves *Genolopa ampullacea*, the type species, still in the genus which is at least for the present recognized as distinct from *Proctotrema*.

Discussion. The specimens from the Pacific were so similar to the specimen from *Anisotremus virginicus* that an earlier description for the latter fitted the former in almost all details. Figures of both (figs. 87 and 89) reveal the differences. The Atlantic form (fig. 89) is somewhat more contracted, a condition probably explaining the folded prepharynx. The chief difference is the larger size of the cirrus sac in the Atlantic form where it reaches beyond the ovary. Since the body contraction might be involved here and since individual variation might also be a factor, that difference alone is not considered sufficient to warrant a species. The spines of the cirrus sac seem longer in the Pacific form, but the entire cirrus apparently varies greatly with contraction. In the Atlantic form it was inserted into the genital atrium (without extension through the genital pore) and back as far as the spiny region of the metraterm. In the Pacific form it was retracted seemingly by inversion, much like a proboscis.

It is of interest to note that another specimen of *Anisotremus interruptus* from James Island contained *Hamacreadium oscitans* Linton, which is likewise found in *A. virginicus* at Tortugas, Florida.

Specimens of what seems to be this same species were collected by Dr. A. O. Foster from *Anisotremus pacifici* (Günther) from Miraflores Locks in the Panama Canal in 1937. These specimens varied considerably in size and were somewhat contracted. Most of them were smaller than the other collections. A 0.397 mm specimen was immature, but one, 0.435 long, contained eggs. The Panama Canal material agrees with *P. longicaecum* in sucker ratio, egg size, length of ceca, and terminal genital organs.

Proctotrema costaricae, new species

(Plate 44, fig. 90)

Host: A yellow-striped grunt or porgy, possibly of the genus *Medialuna*, taken in nearly fresh condition from the stomach of *Seriola* species

Location: Ceca and intestine

Locality: Port Culebra, Costa Rica

Number: 4 specimens

SPECIFIC DIAGNOSIS OF PROCTOTREMA COSTARICAE

Body oval to elongate, 0.786 to 0.995 by 0.397 to 0.450, rounded at each end, anterior end somewhat truncated; spined except near posterior end (in two specimens spines were lost). Oral sucker terminal, funnel

shaped, longer than wide, 0.144 to 0.165 in width. Acetabulum about $\frac{1}{3}$ body length from anterior end (at moderate body extension), 0.085 to 0.097 in diameter or a little over half the diameter of oral sucker. Genital pore median, posterior to intestinal bifurcation, varying from about midway between suckers to considerably nearer acetabulum. Prepharynx short; pharynx usually displaced to lie beside posterior portion of oral sucker, about twice as long as wide (0.068 by 0.032 in the type specimen); fairly short esophagus; ceca not reaching posterior end of body and apparently ending in region of testis. Testis approximately in midbody, not far posterior to acetabulum, ovoid; cirrus sac large, curved claviform in shape, extending diagonally backward and to the left, 0.262 to 0.285 long, 0.087 to 0.116 wide; large ovoid seminal vesicle in basal third of cirrus sac; middle third of sac containing a pars prostatica with large, tall, thin-walled cells and prostatic cells; distal third of sac containing a spined cirrus. Ovary to the right, immediately postacetabular and pretesticular, overlapping both testis and acetabulum, ovoid, smooth, longer than wide. Vitellaria consisting of 8 or 9 follicles in each of 2 widely separated lateral groups at the acetabular and ovarian level, the right group overlapping the ovary dorsally. Uterus filling almost the entire hindbody, partly overlapping testis; sperm cells present in early coils of uterus. Metraterm sac 0.202 to 0.262 long by 0.076 to 0.082 greatest width (almost as large as cirrus sac), extending along left side of and parallel to cirrus sac, containing a large metraterm vesicle (filling its basal half) and a spined metraterm. Uterus entering metraterm sac laterally just anterior to vesicle. Eggs elongate, 25 to 28 by 8 to 9 μ . Excretory vesicle not clearly seen, but in one specimen it seemed to be a very short sac.

Comparisons. *Proctotrema costaricae* differs from all previously named species, except *P. bacilliovatum* Odhner, 1911, in its long narrow eggs. It differs from *P. bacilliovatum* in shape of ovary and testis, in development of the thin-walled prostatic vesicle cells, structure of the metraterm sac, and in that the egg length is about 3 times the egg width instead of 4 times as in *P. bacilliovatum*. In both species the eggs are 8 to 9 μ in width, but in *P. bacilliovatum* they are 31 to 33 μ instead of 25 to 28 μ .

***Paramonorcheides bivitellus*, new species**

(Plate 44, fig. 91)

Host: *Symphurus atramentatus* Jordan and Bollman

Location: Intestine

Locality: James Island, Galapagos

Number: One specimen

The genus *Paramonorchoides* Yamaguti, 1938 apparently differs from *Monorchoides* Odhner, 1905 chiefly in its lobed ovary. The long ceca and the posterior group of vitelline follicles of the present species might almost be of generic value, but the species is included in Yamaguti's genus.

SPECIFIC DIAGNOSIS OF *PARAMONORCHOIDES BIVITELLOSUS*

Length 0.675; greatest width (just posterior to midbody) 0.280; both ends tapering slightly and rounded; body spined except posterior to testes. Oral sucker 0.102 in diameter; acetabulum 0.095 in diameter; ratio almost equal, oral sucker slightly larger. Forebody 0.220 or about $\frac{1}{3}$ body length, rich in gland cells. Prepharynx very short or lacking; pharynx 0.049 long by 0.042 wide; esophagus very short or lacking; intestinal bifurcation about midway between suckers or slightly nearer oral sucker; ceca extending to near posterior end of body, curving inward opposite testes. Genital pore midway between acetabulum and intestinal bifurcation, submedian or slightly to the right (cirrus protruded). Testes 2, about twice longer than wide, at level of beginning of posterior third of body, symmetrical, far apart, near sides of body, largely or wholly extracecal. Cirrus sac (with cirrus protruded) claviform, from pore to posterior edge of acetabulum, largely to right of acetabulum, with ovoid seminal vesicle, 2 types of spines; cirrus with thorn-shaped spines. Ovary lobed, to the right, close to right testis to which it is partly median, partly anterior, ventral to right cecum; seminal receptacle not seen; metraterm claviform, spiny, from genital pore to posterior edge of acetabulum, lying to left of cirrus sac, largely dorsal to acetabulum, about same length as cirrus sac; vitelline follicles arranged in two lateral groups on each side divided by testes; anterior group from mid-acetabular level to testes, chiefly lateral to ceca; posterior group of few follicles extending a short distance posterior to testes, largely ventral to ceca. Eggs thick shelled, sometimes almost spherical, 19 to 20 by 15 to 16 μ . Uterus filling most of middle of body but not reaching posterior end by a short distance. Extent of excretory vesicle not determined.

The name *bivitellosus* refers to the double grouping of vitellaria on each side of the body.

Discussion. This species is placed in the genus *Paramonorchoides* because of the 2 testes and the lobed ovary. It differs from both *P. awa-*

tati Yamaguti, 1938 and *P. siremboni* Yamaguti, 1938 in several respects, notably: the posterior group of vitellaria, the anterior group of vitellaria not reaching anterior to the acetabulum, the longer ceca, shorter esophagus, and wider eggs. The testes are more posterior and less elongate.

***Telolecithus tropicus*, new species**

(Plate 44, figs. 92-94)

Host: *Selar crumenophthalmus* (Bloch)

Location: Intestine

Locality: Bahia Honda, Panama

Number: 2 specimens in one of 2 hosts examined

SPECIFIC DIAGNOSIS OF TELOLECITHUS TROPICUS

Body flat, elongate, more or less tapering at each end, forebody thickly spined but spines soon disappear posterior to acetabulum. Type specimen 1.074 long, 0.217 wide. Suckers weakly muscular; oral sucker slightly wider than long, not funnel shaped, 0.060 in transverse diameter; acetabulum 0.060 to 0.065 in diameter or about equal to oral sucker; forebody 0.375 in length.

Very short prepharynx, fairly large pharynx, 0.058 long by 0.033 wide; very long, narrow esophagus, 0.175 in length or more than 3 times length of pharynx; ceca inconspicuous, extending almost but not quite to posterior end of body.

Genital pore a median, transverse slit immediately in front of acetabulum. Testis single, large, elongate, slightly irregular in outline, in posterior third of body, extending almost to posterior end of body. Cirrus sac (fig. 93) clavate, bowing around right side of acetabulum, size 0.177 (length) by 0.054 (greatest width, near base); containing a large ovoid seminal vesicle in its basal third, in its middle third a narrow tube surrounded by large transparent cells, in its distal third a spined cirrus; prostatic cells chiefly around base of cirrus; gland cells also present around seminal vesicle. Genital atrium short but spacious, unspined. Ovary elongated, very irregularly lobed, to the left partly covering left cecum, immediately anterior to testis; uterine seminal receptacle; uterus extending posteriorly to overlap testis or (in one specimen) even posterior to the testis, entering base of metraterm, without bulb; metraterm (fig. 93) clavate, almost as large as cirrus sac, bowing around left side of acetabulum, its basal portion largely vesicular with a few large spines (fig. 93) and with a central fibrous mass; anterior third of metraterm with short

triangular spines; eggs tapering abruptly at one end, more rounded at the other, 24 to 26 by 12 to 15 μ . Vitellaria in the form of indefinite follicles usually more or less fused together, from about the anterior end of the ovary to the tips of the ceca, not quite reaching posterior end of the body and not reaching acetabulum by some distance, largely lateral, partly median, overlapping testis and uterus. Excretory vesicle very short, Y shaped.

The name *tropicus* is for the region of collection.

Comparisons. This trematode is placed in the genus *Telolecithus* chiefly because of the posterior location of the vitellaria. It bears some resemblance to *Paraproctotrema* Yamaguti, 1934 but differs in the location of the vitellaria, in lacking the uterine bulb, in shorter ceca, and in other details. It differs from *Telolecithus pugetensis* Lloyd and Guberlet, 1932 in body shape, length of esophagus, extent of vitellaria, shape of ovary and testis, in the terminal entrance of the uterus into the metraterm, in shape of eggs. It resembles *Genolopa trifolifer* Nicoll, 1915 in many respects, although the vitellaria extend more posteriorly, the gonads are of different shape, the prepharynx is shorter, and the esophagus is longer. It is probable that the genus *Genolopa* should be restricted to monorchids with a median cluster of much longer spines in the cirrus sac, a character of *G. ampullacea* Linton, the type species. Such a view, however, would remove most of the species now contained in the genus.

Proctoeces magnorus, new species

(Plate 45, fig. 95)

Host: *Caulolatilus anomalus* (Cooper) ?

Location: Intestine

Locality: Cerros Island, Mexico

Number: One specimen

SPECIFIC DIAGNOSIS OF PROCTOECES MAGNORUS

Body smooth, subcylindrical, equally wide along most of its length, posterior end pointed, anterior end blunt. Length 2.862, width 0.412; forebody 0.825; posttesticular space 0.640. Oral sucker 0.375 deep, 0.435 long; acetabulum on body stalk, 0.322 wide, 0.310 long, with transverse aperture; within its cavity is a longitudinal groove with muscular edges (fig. 95). Prepharynx very short; pharynx large, 0.307 long by 0.217 wide; esophagus very short; ceca thin walled, inconspicuous, reaching to near posterior end of body. Genital pore slightly to the left, at base of



acetabular stalk, posterior to intestinal bifurcation. Testes spherical, diagonal, not far apart but separated by a few eggs in the uterus, in posterior half of body. Cirrus sac claviform, slightly curved, extending only slightly posterior to acetabulum; 0.502 long by 0.130 in greatest width (near its base), containing a coiled tubular seminal vesicle in its basal third; a long pars prostatica and a short cirrus. Genital atrium large. Cirrus may be inserted in terminal portion of uterus. Ovary spherical or subspherical, a short distance pretesticular, separated from testes by uterine coils; vitelline follicles few, in 2 lateral groups from anterior end of ovary to anterior end of anterior testis; extending medianly dorsal to uterus between ovary and testis; eggs 32 to 37 by 15 to 19 μ . Excretory vesicle not traced.

The name *magnorus* refers to the relatively large oral sucker.

Comparisons. Two species of Proctoeces have been described, *P. maculatus* (Looss) Odhner, 1911 from *Labrus merula* and *Crenilabrus pavo* from the Mediterranean (also reported by Yamaguti from several fishes of Japan) and *P. erythraeus* Odhner, 1911 from *Chrysophrys bifasciata* from the Red Sea. *P. magnorus* is very different from *P. maculatus* in sucker ratio, in extent of vitellaria, and in egg size. It is more similar to *P. erythraeus*. Odhner gives a very brief description and no figure of *P. erythraeus*. Compared with *P. maculatus*, the acetabulum is "at least $\frac{1}{3}$ smaller," eggs about 45 μ long, and the vitellaria shorter. These differences are all in the direction of *P. magnorus*, which, however, seems to have a larger oral sucker, making the sucker ratio even greater than in *P. erythraeus*, and also to have smaller eggs (the largest of which is 37 μ long). It is probable the vitellaria are even shorter in *P. magnorus* than in *P. erythraeus*. Assuming the other 2 species are alike in other respects, *P. magnorus* shows slight differences in possessing an acetabular stalk, shorter esophagus, cirrus sac not reaching ovary, and a longitudinal groove within the acetabular cavity.

Tergestia laticollis (Rud., 1819)

Host: *Caranx caballus* Günther

Location: Intestine

Locality: Port Culebra, Costa Rica

Number: 5 specimens from one host

The genus *Tergestia* was named by Stossich in 1899 with *T. laticollis* (Rud.) as type species. Odhner in 1911 redescribes the genus and the

species *T. laticollis* and associates the genus along with Proctoeces Odhner with the family Fellodistomidae (= Steringophoridae Odhner). Tergestia can probably be considered in the subfamily Haplocladinae. Its fellodistomid relationship can be clearly seen in the terminal male organs.

The genus Theledera Linton, 1910, established for *Distomum pectinatum* Linton, 1905, is an evident synonym of Tergestia. The genus Cithara, named by MacCallum in 1917 with *C. priacanthi* as type, is likewise an evident synonym of Tergestia.

Five species of Tergestia have been named: *T. laticollis* (Rud.); *T. acanthocephala* (Stoss.); *T. pectinata* (Linton) n. comb.; *T. priacanthi* (MacCallum) n. comb.; and *T. acanthogobii* Yamaguti, 1938. *T. pectinata* and *T. priacanthi* are poorly described, being based on poor material. *T. priacanthi* in particular, since egg measurements are not given, cannot be identified as to species from its description.

Linton's (1905, p. 389) *Distomum pectinatum* from *Bairdiella chrysura* and *Trachinotus carolinus* at Beaufort, North Carolina, was reported by Linton (1910) from *Auxis thazard* at Tortugas, Florida, and renamed *Theledera pectinata* (Linton). For the Tortugas material, Linton gives but a few measurements, which differ from the Beaufort description in that the suckers are almost equal in size (0.14 and 0.18) whereas in the specimens from Beaufort the acetabulum was over twice the diameter of the oral sucker (oral sucker 0.10, acetabulum 0.25). I have collected specimens from *Bairdiella chrysura* at Beaufort and can confirm the sucker ratio stated by Linton. Furthermore, there occur at least 2 species of Tergestia at Tortugas, one of which [collected by the writer from *Trachurops crumenophthalmus* (Bloch) and *Priacanthus arenatus* Cuv. and Val.] has a sucker ratio of approximately 1:2 or a little over 2 and probably corresponds to the original *D. pectinatum* from Beaufort; the other [collected from *Gymnosarda pelamis* (Linn.) and *G. alletterata* (Raf.)] possesses subequal suckers with the acetabulum usually very slightly larger than the oral sucker. This latter form is probably the *Theledera pectinata* of Linton, 1910.

The Pacific material agrees very well with that form from the Atlantic possessing subequal suckers. In 2 of 5 specimens the ratio was about 3:4, but in the other 3 the acetabulum was only very slightly larger than the oral sucker. This material is to be compared with *T. laticollis*. There is agreement in shape of pharynx, in distribution of vitellaria, in sucker ratio, and fair agreement in egg size. My Pacific material has eggs 22 to 26 by 12 to 17 μ ; my Atlantic material has eggs 25 to 29 by 17 to 20 μ ;

and Odhner reports 22 to 23 by $15\ \mu$ for *T. laticollis*. In view of individual variation and the fact that these measurements overlap one another, it does not seem possible to separate these forms on egg size, and they are all considered to be *T. laticollis*.

These new hosts and localities for the species extend its already wide distribution. It is now reported from the following hosts and regions: *Caranx trachurus* from the Mediterranean (reported by Odhner, 1911); *Trachurus trachurus* from the North Sea (reported by Nicoll, 1913); *T. trachurus* from the Black Sea (reported by Wlassenko, 1931); *Scomber japonicus* and *T. trachurus* from Japan (reported by Yamaguti, 1934, 1938); *Auxis thazard*, *Gymnosarda pelamis*, and *G. alletterata* from Tortugas, Florida; and *Caranx caballus* from Port Culebra, Costa Rica.

Tergestia pectinata (Linton) occurring at Beaufort, North Carolina, and Tortugas, Florida, is to be considered a different species differing chiefly in sucker ratio.

Family Accacoeliidae Looss, 1912

Tetrochetus proctocolus, new species

(Plate 45, figs. 96, 97)

Host: *Cheilichthys annulatus* (Jenyns)

Probably also (rarely) in *Trachinotus rhodopus* (Gill)
and *Angelichthys* sp.

Location: Rectum

Locality: Galapagos Islands

Number: One in each of 2 hosts, 3 in another of a total of 8
examined

The genus *Tetrochetus* was named by Looss in 1912 with *T. raynerius* (Nardo) as type. Dollfus (1935, p. 205-206) in a review of the Accacoeliidae points out that only 2 valid differences seem to separate *Tetrochetus* from *Orophocotyle* Looss, 1902. These are the lack of the anterior duplication of the acetabulum and the more continuous and branching vitellaria in *Tetrochetus*. Three species of *Tetrochetus* are known: *T. raynerius* (Nardo); *T. coryphaenae* Yamaguti, 1934; and *T. hamadai* Fukui and Ogata, 1935.

SPECIFIC DIAGNOSIS OF TETROCHETUS PROCTOCOLUS

Body smooth, cylindrical, 2. to 5.4 in length by 0.442 to 1. in width; forebody 0.442 to 1.012 or almost exactly the same as greatest body

width. Color in life, red. Oral sucker subspherical, 0.187 to 0.277 in transverse diameter, with internal conelike elevation at its base; acetabulum longer than wide, protuberant on a short stalk, with longitudinal aperture, 0.210 to 0.270 in depth (only one specimen in a position for transverse measurement which was 0.345), 0.277 to 0.472 in length. The ratio of transverse diameters about 3:4. Depth of acetabulum only slightly greater than width of oral sucker. Short prepharynx; pharynx cylindrical, 0.102 to 0.178 long by 0.076 to 0.136 wide; esophagus fairly long, joining ceca dorsal to acetabular stalk; intestine H shaped; anterior ceca reaching to midpharynx level or beyond to the base of oral sucker. Nine dorsal diverticula of varying length at the intestinal bifurcation (fig. 97). Posterior ceca wide, extending to posterior end of body, uniting with excretory vesicle.

Genital pore median, opposite base of oral sucker. Testes diagonal, smooth, rounded, slightly longer than wide, in middle of body (midline lies between the testes), anterior testis dorsal, posterior testis ventral, separated by coils of the uterus and by vitellaria. Seminal vesicle a much convoluted tube extending a short distance posterior and a short distance anterior to acetabulum; pars prostatica a straight tube extending almost to the genital pore; prostatic gland free; no copulatory organs. Ovary ovoid or bean shaped, smooth, wider than long, median, about $\frac{1}{3}$ from posterior end of body; Mehlis' gland spherical; yolk reservoir ventral to Mehlis' gland; vitellaria consisting of coiled tubes with numerous branches (not of isolated fragments), extending from just posterior to acetabular stalk to ovary (not posterior to ovary); uterus with ascending (ventral) coil to near acetabulum, winding descending posterior coils becoming ventral posterior to testes reaching to near posterior end of body, a dorsal ascending little coiled limb which passes ventral to anterior testis then almost straight to near genital pore where it joins the male duct. Eggs thin shelled, light yellow, ovoid, 22 to 25 by 14 to 17 μ (one specimen with many abnormal eggs had a few up to 32 by 25 μ , but egg size seemed rather constant in normal specimens). Excretory vesicle short; excretory tubes much coiled in anterior region of body, extending to oral sucker. These tubes come close together, but whether or not they unite was not determined.

The name *proctocolus* is from *procto* (= anus) and *-colus* (= inhabiting) and refers to the location of the parasite in the rectum.

Discussion. In the 2 mm specimen the eggs had not reached the portion of the uterus posterior to the ovary; hence, it was but recently sexually mature. The number of dorsal diverticula of the intestinal bifurca-

tion may vary. They could be counted in but 2 specimens in both of which the number was 9.

Although *T. hamadai* is from a related host in Japan, *T. proctocolus* is more similar to *T. coryphaenae*. I have collected what I consider to be *T. coryphaenae* from *Coryphaena hippurus* at Tortugas, Florida. On the basis of this material the questions raised by Dollfus (1935) can be answered by saying that no copulatory organ is present and the vitellaria are tubular and continuous, thus confirming the location of the species in the genus *Tetrochetus*.

T. proctocolus and *T. coryphaenae* are almost identical. The most pronounced difference is egg size. My material of *T. coryphaenae* has constantly larger eggs (32 to 35 by 16 to 19 μ). Yamaguti records 26 to 33 by 16 to 19 μ for *T. coryphaenae*. Except for a specimen having both abnormally small and abnormally large eggs, *T. proctocolus* eggs were consistently 22 to 25 by 14 to 15 μ . Another difference between the 2 species is a relatively somewhat larger oral sucker in *T. coryphaenae*. Because of the usual lateral view of specimens the most available dimensions to compare are the lengths (anterior-posterior) of these suckers. The following proportions represent in hundredths of millimeters these ratios (oral sucker above acetabulum):

<i>T. proctocolus</i>	$\frac{16}{27}$	$\frac{17}{30}$	$\frac{23}{47}$	$\frac{24}{35}$	$\frac{24}{39}$		
<i>T. coryphaenae</i>	$\frac{18}{25}$	$\frac{27}{39}$	$\frac{28}{36}$	$\frac{36}{44}$	$\frac{36}{46}$	$\frac{37}{42}$	$\frac{20}{29}$ (Yamaguti's record)

T. coryphaenae seems to have thicker vitelline tubes with fewer coils between anterior testis and acetabulum. The anterior extent of the uterus and vitellaria is probably too variable to separate the two species. *T. coryphaenae* is from the intestine of its host rather than from the rectum.

T. proctocolus is distinctly different from *T. raynerius* in sucker ratio and location of the gonads. It differs from *T. hamadai* in sucker ratio, in shape of pharynx, and in more posterior extent of vitellaria.

A single specimen of *Tetrochetus* from the intestine of *Trachinotus rhodopus* at Chatham Island is probably *T. proctocolus*. The sucker ratio would so indicate, as well as most of the eggs, but a very few eggs were abnormally large as compared with others. Another single specimen, probably *T. proctocolus*, was collected from the intestine of an angelfish (*Angelichthys* sp.) from the Galapagos. In this specimen, a peculiar abnormality was the entire absence of egg shells. The uterus was fully developed and filled with naked embryos. The vitellaria were normal.

Family **Heterophyidae** Odhner, 1914**Paracryptogonimus americanus**, new species

(Plate 45, figs. 98-100)

Hosts and Localities: *Lutianus novemfasciatus* (Gill) or *cyanopterus* (Cuv. and Val.)

Tangola Tangola, Mexico

Lutianus jordani (Gilbert) ?

Secas Islands, Panama

Location: Ceca and intestine

Numbers: Large number collected, especially from the former host and locality

SPECIFIC DIAGNOSIS OF PARACRYPTOGONIMUS AMERICANUS

Body thick and plump with thick, somewhat wrinkled cuticula covered with fine spines; spines easily lost in posterior region of body; anterior end broadly rounded; posterior half of body tapering slightly and bluntly rounded. Most specimens 2.308 to 2.376 long by 1.147 to 1.555 in greatest width (anterior to midbody), but one mature specimen only 0.985 by 0.690. Oral sucker subterminal, almost circular, 0.300 to 0.307 in diameter (0.144 in the 0.985 specimen); single row of 52 to 57 oral spines. Preoral cavity present (fig. 99), formed by body surface enclosing oral sucker; oral spines covered by this circular fold. Oral spines about 26 μ long, tapering but not sharply pointed, sometimes slightly forked at base. Acetabulum 0.187 to 0.225 in diameter (about $\frac{2}{3}$ diameter of oral sucker), deeply embedded in body, with transverse aperture. Forebody short, varying with contraction, usually about 0.540 but sometimes as short as 0.300 or practically the diameter of the oral sucker; with many gland cells.

Genital pore median near aperture of acetabular cavity at anterior edge of acetabulum, a short distance posterior to intestinal bifurcation. Pseudosucker lacking.

Prepharynx present (fig. 99) but evident only in sections; pharynx partly dorsal to oral sucker, slightly wider than long (0.120 to 0.142 in length by 0.150 to 0.165 in width); esophagus apparently lacking; ceca large, diverging laterally to bow backward, extending in sides of body to near posterior end.

Testes 2, ovoid, slightly wider than long, smooth, symmetrical, far apart near lateral edges of body, ventral to ceca, separated by uterus, at about midbody level. Seminal vesicle an elongated, irregularly lobed

sac, beginning just anterior to ovary, curving around left side of acetabulum to genital pore. Near the pore, the vesicle narrows to a fine tube; cirrus and cirrus sac lacking; prostate gland not evident, probably lacking.

Ovary large, median, multilobed, immediately anterior to level of testes. Seminal receptacle large, dorsal, and slightly anterior to ovary. Laurer's canal present. Uterus extending backward in lateral coils in right half of body to near ends of ceca (about $\frac{3}{4}$ distance between ovary and posterior end of body), then coiling forward in left half of body to genital pore. Eggs brown, elongated, tapering toward one pole, 20 to 25 by 9 to 10 μ . Vitellaria in 2 groups, extending from posterior edge of acetabulum to posterior edges of testes; some follicles extracecal; a few are ventral to ceca and to testes; most are dorsal, extending medianly to or almost to ovary which separates the 2 groups. Excretory vesicle large, much inflated, Y shaped, forking near ovary, with crura reaching to anterior end of body. Excretory pore terminal or ventrosubterminal, with conspicuous radial muscle bands.

Discussion. *P. americanus* differs in several respects from *P. acanthostomus* Yamaguti, 1934, the only other species in the genus. The body is broader in its anterior half, the oral sucker is more posterior in position, the ovary and testes are more anterior, the ceca are farther apart, and the eggs more elongate. There are more oral spines in *P. americanus* (52 to 57 as compared with 49), and the preoral chamber seems to be unique. The acetabulum is relatively larger in *P. americanus*.

It is of interest to note that *P. acanthostomus* is from a related host, *Lutianus vitta*.

Yamaguti classified *Paracryptogonimus* in the *Acanthostomidae* Poche, 1926, although noting that Fuhrmann considered the related genus *Cryptogonimus* in the *Heterophyidae*. Yamaguti lists as related genera: *Cryptogonimus* Osborn, *Biovarium* Yamaguti, *Allacanthochoasmus* Van Cleave, and *Caecincola* Marshall and Gilbert. *Siphoderina* Manter, 1934 was named at about the same time that Yamaguti's paper appeared. It is a closely related genus, differing chiefly in the lack of oral spines, and brings together the genera *Siphodera*, *Siphoderina*, and *Paracryptogonimus*.

Mueller and Van Cleave (1932, pp. 114-132) have discussed the family *Heterophyidae* with special reference to forms occurring in fishes. They state (p. 119): "Likewise the *Cryptogoniminae* of Osborn (1903), though never previously assigned as a subfamily under the *Heterophyidae*, is based upon a concept which falls wholly within the *Heterophyinae*

except for the fact that its members are from fishes." They consider Cryptogoniminae a synonym of Heterophyinae. The writer agrees with this conclusion.

These opinions suggest a similarity between the Acanthostomidae and the Heterophyidae. Such a similarity does seem to exist, and a realignment of the two families in relationship to each other is needed. Acanthostomidae is perhaps a heterogeneous group, some of the genera in it (e.g. *Maesnia* Chatterji, 1933 and *Anoikostoma* Stossich, 1899) apparently possessing a cirrus sac. Most of the genera listed in the Acanthostomidae could be logically placed in the Heterophyidae. It seems probable that too much emphasis has been placed on an oral crown of spines and not enough consideration given to the terminal genital structures and posterior extent of the uterus. Perhaps knowledge of life cycles will be necessary to elucidate the status of the two families.

Mueller and Van Cleave recognized six subfamilies of the Heterophyidae. Manter (1934, p. 325) considered Siphodera and Siphoderina in a new subfamily Siphoderinae. It seems apparent, however, that Siphodera, Siphoderina, *Cryptogonimus*, *Paracryptogonimus*, *Centrovarium*, *Biovarium*, and *Caecicola* are similar enough to be classified in one subfamily. *Paracryptogonimus*, in particular, shows relationship to *Neochasmus* and *Allacanthochasmus* in its oral spines, deeply lobed ovary, and posterior uterus, differing in lacking a gonotyl. But the presence or absence of a gonotyl has not been considered a subfamily character. The plate of heterophyid genera given by Mueller and Van Cleave (1932, pl. 25, p. 129) shows a series in which *Paracryptogonimus* and *Siphodera* might well fit. Mueller and Van Cleave consider the oral spines a subfamily distinction between Heterophyinae and Neochasminae. Since these spines are absent or present in marine trematodes as closely related to each other as *Siphoderina* and *Paracryptogonimus*, they do not seem to constitute more than a generic difference.

Yamaguti (1938) has recently discussed certain Japanese trematodes in the genera *Exorchis* Kobayashi, 1921 and *Pseudexorchis* Yamaguti, 1938. His subfamily Exorchiinae is essentially similar to Siphoderinae and hence should also be considered a synonym of Heterophyinae. In this connection it might be noted that the cercaria of *Pseudexorchis major* (Hasegawa, 1935) "resembles the cercaria of *Metagonimus yokogawai* so closely that even an experienced trematologist might be unable to distinguish the two without experimental evidence."

It is the present view of the writer that Siphoderinae Manter, 1934, Neochasminae Van Cleave and Mueller, 1932, Cryptogoniminae Osborn, 1903, and Exorchiinae Yamaguti, 1938 are all synonyms of Heterophyinae Ciurea, 1924.

Siphoderoides vancleavei, new genus, new species

(Plate 45, figs. 101, 102)

Host: *Orthostoechus maculicauda* Gill

Location: Intestine

Locality: Port Utria, Colombia

Number: One specimen

The status of this trematode should be qualified by the limitations of a single specimen. This specimen is, however, favorable to show most of the significant features with the exception of the exact length of the ceca. The trematode is evidently a heterophyid similar to Siphodera and Siphoderina but is distinctive in possessing a conspicuous, muscular gonotyl posterior to the acetabulum.

SPECIFIC DIAGNOSIS OF SIPHODEROIDES VANCLEAVEI

Body more or less flattened, entirely spined, broadly rounded at each end, posterior end broad and scarcely tapering at all, anterior end only slightly tapering; length 1.485; width 0.585. Forebody 0.427 or between $\frac{1}{3}$ and $\frac{1}{4}$ total body length; pigment granules in forebody. Oral sucker 0.180 in transverse diameter, without oral spines; acetabulum 0.075, embedded in body; sucker ratio about 5:2. Gonotyl (fig. 102) with transverse aperture, immediately posterior to acetabulum, with semi-circular muscles. Acetabulum with 2 lateroposterior muscles extending diagonally backward into the body. Prepharynx short; pharynx 0.102 long by 0.087 wide; esophagus short; bifurcation midway between pharynx and genital pore; ceca extending posterior to testes but not reaching posterior end of body, probably ending shortly behind the testes. Genital pore (fig. 102) median, immediately anterior to acetabular aperture, not on surface of body but within the body fold which enfolds acetabulum. Testes 2, lateral, far apart, in posterior half of body about midway between acetabulum and posterior end of body, elongated, unlobed, extracecal, partly covered ventrally by uterus. Seminal vesicle large, saclike, apparently undivided, from anterior edge of acetabulum almost to ovary; prostatic vesicle short, at anterior edge of acetabulum; cirrus and cirrus sac lacking; genital atrium tubular, muscular.

Ovary multilobed, median, chiefly intercecal, immediately pretesticular; seminal receptacle anterior to ovary, posterior to seminal vesicle; Laurer's canal dextral, preovarian; uterus largely filling body posterior to ovary, descending coils to the right, ascending coils to the left, crossing to extreme left at testicular level, then across the body anterior to ovary to loop over the right testis, then almost straight to atrium. Vitellaria of numerous follicles from level of genital pore to midovarian level, largely lateral and ventral to ceca, tending to be more median just anterior to ovary. Eggs brown, 19 to 20 by 7 to 9 μ . Colorless glandular masses filling forebody. Excretory vesicle Y shaped.

The name *Siphoderoides* indicates relationship to *Siphodera*. The specific name is in honor of Dr. H. J. Van Cleave.

GENERIC DIAGNOSIS OF SIPHODEROIDES

Heterophyinae of fairly large size, elongate with rounded ends; oral sucker much larger than acetabulum, without special spines; acetabulum embedded in body; muscular gonotyl with aperture present posterior to acetabulum; testes 2, lateral, extracecal; seminal vesicle large, saclike, undivided; ovary median, multilobed; vitellaria follicular, anterior to testes.

Comparisons. The presence of a gonotyl posterior to the acetabulum distinguishes this genus from *Siphodera* Linton, 1910; *Siphoderina* Manter, 1934; *Exorchis* Kobayashi, 1921; *Pseudexorchis* Yamaguti, 1938; *Centrovarium* Stafford, 1904; and *Metadena* Linton, 1910. *Neochasmus* has a gonotyl but also oral spines and a fragmented ovary.

Hemiuridae Lühe, 1901

***Parahemiurus merus* (Linton, 1910) Woolcock, 1935**

(Plate 46, fig. 103)

Hosts: *Opisthonema libertate* (Günther)

Anchovia arenicola Meek and Hildebrand

Location: Stomach

Locality: La Plata Island, Ecuador

Number: 3 specimens in one host, one specimen in another

Discussion. *Hemiurus merus* was named by Linton in 1910 from *Clupanodon pseudohispanicus* at Tortugas, Florida. He noted the muscular undivided seminal vesicle as distinguishing the species from *H. appen-*

diculatus. Linton (1910, p. 60) also suggested that this character might be of generic value. Vaz and Pereira in 1930 named the genus *Parahemiurus* with *P. parahemiurus* from *Sardinella aurita* in Brazil as type. This genus is distinguished from *Hemiurus* by the muscular undivided seminal vesicle. As suggested by Manter (1934, p. 304) and accepted by Woolcock (1935), *H. merus* is a member of the genus *Parahemiurus*.

P. merus has been collected by the writer from 9 different species of hosts at Tortugas, Florida. Twenty-six specimens have been studied. No differences between *P. merus* and the description of *P. parahemiurus* can be detected except in the extent of the cuticular denticulations or rings. Since their distribution on the 2 surfaces of the body is not indicated by Vaz and Pereira, the "anterior fourth of the body" extent described might apply only to the complete rings on the dorsal surface. I consider that *P. parahemiurus* is a synonym of *P. merus*.

Eight other species of *Parahemiurus* have been named. Differences between some of these are slight and indicate that variations within a single species should be better known. Specimens of *H. merus* from Tortugas indicate that egg size is variable in the species, at least in different individuals. For example, eggs in three specimens measured 18 to 22 by 8 to 10 μ , 23 to 24 by 10 μ , and 30 by 10 μ ; and Linton records 27 by 10 μ . The limits seem to be 18 to 30 by 8 to 10 μ in preserved specimens, while Vaz and Pereira's measurements would extend the width to 14 μ . Another variable character is seen in the form of the vitellaria which may be unlobed or slightly lobed. The uterus may or may not enter the ecsoma. The cuticular denticulation seems fairly constant. The body folds or rings extend entirely across the dorsal surface only as far back as the acetabular region, whereas on the ventral surface they continue to the level of the ovary or in some specimens to the posterior edge of the vitellaria or, in a few specimens, slightly beyond (fig. 103). Near their termination they become inconspicuous. There may be some variation as to how far dorsally the plicae reach, but in both the Atlantic and the Pacific material favorable to show this character they extend well around the edges of the body as far back as the testes but do not meet dorsally posterior to the acetabulum. The unringed dorsal area gradually widens posteriorly (fig. 103). This denticulation is similar to that of most of the described species but different from that of *P. australis*, probably *P. anchoviae*, and the new species following.

From these observations, I believe that *P. platichthyi* Lloyd, 1938 from Puget Sound is a synonym of *P. merus*. *P. atherinae* Yamaguti,

1938 and *P. harengulae* Yamaguti, 1938 seem to me to be synonyms, also. The short distance between the ovary and testes I have observed in young individuals. *P. atherinae* is characterized by a wall of the seminal vesicle which is "not very thick." The thickness of the wall of the seminal vesicle varies greatly according to the volume of sperm cells within it. One specimen from Florida had a completely empty vesicle and was rounded (43 by $43\ \mu$) with very thick walls ($17\ \mu$). *P. harengulae* has eggs from 29 to $34\ \mu$ long, which is a little larger than the largest I have seen in *P. merus*, but the smaller size is within the limits of the latter species. Perhaps the chief difference shown by *P. harengulae* is in the dorsal denticulations reaching to the testes, but it is not made clear whether they extend entirely across the dorsal surface at this level.

P. sardinae and *P. seriola* are also possibly synonyms of *P. merus* but may be justified by the more posterior position of the ovary and the larger ecsoma. In none of my specimens is the ovary so far posterior.

There is thus indicated for *P. merus* a wide distribution from the Gulf of Mexico into the South American Atlantic, in the American Pacific, and probably in Japanese waters. Proposed synonyms are: *P. parahemiurus*, *P. platichthyi*, *P. atherinae*, *P. harengulae*. Other species are: *P. australis*, *P. anchovia*, *P. sardinae*, *P. seriola*, and a new species described below.

SPECIFIC DIAGNOSIS OF PARAHEMIURUS MERUS (LINTON)

Length 1.14 to 3 , ecsoma usually extended. Body rings extending to level of ovary or vitellaria on ventral side, but the middle of the dorsal surface is not ringed posterior to the acetabulum. Acetabulum 2 to 2.5 times oral sucker. Cecae may or may not enter ecsoma. Genital pore opposite posterior portion of oral sucker. Sinus sac extending beyond anterior border of acetabulum sometimes to middle of this sucker; pars prostatica long, slightly coiled, extending some distance posterior to acetabulum; seminal vesicle subspherical to ovoid, undivided, with muscular wall; testes diagonal or tandem. Ovary transversely ovoid, separated by some distance from posterior edge of body; vitellaria unlobed or slightly 3 - or 4 -lobed; uterus may or may not enter ecsoma; eggs 18 to 34 by 8 to $14\ \mu$, usually 20 to 27 by 9 to $12\ \mu$.

Parahemiurus ecuadori, new species

(Plate 46, fig. 104)

Host: *Anchoviella* sp.

Location: Stomach

Locality: San Francisco, Ecuador

Number: 4 or 5 specimens from a single host

The following diagnosis is based on 2 specimens. The smaller was not quite mature.

SPECIFIC DIAGNOSIS OF *PARAHEMIURUS ECUADORI*

Body cylindrical, ecsoma well developed, partially or wholly extended, denticulations or rings extend along entire length of body; total length 1.012 to 1.147; body length 0.825 to 0.862; tail on 0.862 body extended (fully) 0.322. Greatest width 0.150 to 0.200. Oral sucker 0.090 to 0.102; acetabulum 0.083 to 0.087; sucker ratio about 5:4; forebody $\frac{1}{5}$ to $\frac{1}{6}$ body length. Pharynx elongate and cylindrical, length almost 3 times width, 0.085 to 0.102 by 0.034 to 0.042; esophagus a short thin-walled sac; ceca extend anteriorly then backward into the ecsoma to near its posterior tip. Genital pore ventral to oral sucker. Testes rounded, diagonal, almost tandem; anterior testis about in middle of hindbody; seminal vesicle postacetabular, a large elongate sac, undivided, thick walled, 0.178 by 0.065 in the mature specimen; pars prostatica S shaped, somewhat shorter than seminal vesicle; sinus sac a slender elongate muscular tube, 0.170 in length (in mature specimen), extending to midacetabular level. Ovary in posterior half of hindbody; vitellaria two large, compact, unlobed masses, side by side, immediately postovarian, near posterior end of body; seminal receptacle small; uterus extends into ecsoma; eggs 14 to 15 by 7 μ .

Discussion. The rapid growth of the genus *Parahemiurus* dispels any doubt as to its validity once questioned by the writer (Manter, 1934, p. 304). *P. ecuadori* is easily distinguished from all the other species by the fact that the oral sucker is larger than the acetabulum and by its very elongate pharynx. These two characters are so distinct that no further comparisons are necessary.

Dinurus barbatus (Cohn, 1902)

Host: *Coryphaena hippurus* Linn.

Location: Stomach

Locality: Secas Islands, Panama

Number: Several

These common trematodes of *Coryphaena* occurred in a host only 10 cm in length.

Dinurus longisinus Looss, 1907

Host: *Coryphaena hippurus* Linn.

Location: Stomach

Locality: Secas Islands, Panama

Number: Several

This species was in the same host with *D. barbatus*. Other immature specimens of *Dinurus* were present but were not sufficiently developed for specific identification.

Elytrophallus mexicanus, new genus, new species

(Plate 46, figs. 105-107)

Hosts: *Lutianus viridis* (Val.) ? (type host)

Paranthias furcifer (Cuv. and Val.)

Epinephelus sp.

Epinephelus labriformis (Jenyns)

Caranx lugubris Poey ?

Zalocys stilbe Jordan and McGregor

Mycteroperca sp.

Location: Stomach

Locality: All collections were from Socorro or Clarion Island, Mexico, except for a few specimens from 2 *Paranthias furcifer* from James Island, Galapagos. The trematode is very common at Socorro and Clarion. Three of 4 specimens of *P. furcifer* contained it in that region, but only 2 of 6 specimens of this same host were infected in the Galapagos region.

Number: Common in the above hosts at Clarion and Socorro islands. Collected there 8 times.

SPECIFIC DIAGNOSIS OF ELYTROPHALLUS MEXICANUS

Body smooth, elongate, cylindrical, with protrusible ecsoma; body itself 1.125 to 2.025 in length, tail may be extended up to 0.487 to make a total length up to 2.323; greatest width 0.292 to 0.487, usually at acetabular level, sometimes near posterior end of body. Forebody 0.232 to 0.435 (about $\frac{1}{5}$ body length). Oral sucker subterminal, 0.090 to 0.127 in diameter. Acetabulum circular, 0.244 to 0.397 in diameter. Sucker ratio close to 1:3. Genital pore far anterior, median or submedian, ventral to oral sucker, only a short distance posterior to mouth. Pharynx usually slightly wider than long, 0.039 to 0.053 in length, 0.044 to 0.053 in width; esophagus spherical, saclike, sharply defined, ventral, rather distinct from intestinal ceca which arise from its dorsal side; ceca diverging

then turning posteriorly, sometimes entering ecsoma, sometimes not. Testes subspherical, diagonal, close together, a short distance posterior to acetabulum. Seminal vesicle a thick-walled, elongate or ovoid sac lying close to and overlapping anterior testis; an indistinct tripartite appearance (fig. 106), sometimes evident within the vesicle [a condition similar to that described by Woolcock (1935, p. 321) for *Erilepturus tiegsi*]. Pars prostatica sinuous, usually forming a posterior loop and always overlapping anterior end of vesicle, entirely postacetabular, not reaching appreciably anterior to seminal vesicle; prostatic cells present but not profusely developed. Pars prostatica and a short narrow portion of uterus uniting posterior to acetabulum to form a very long tubular ductus hermaphroditicus or genital sinus enclosed in a sinus sac. Sinus tube almost or quite $\frac{1}{3}$ body length, divided into 4 regions as follows: a narrow, almost straight region slightly wider at its base, extending past acetabulum, sinus sometimes with somewhat convoluted inner wall in anterior part of this region, but tube is uncoiled. Just anterior to acetabulum occurs a thin-walled, usually expanded region of the sac within which the muscular sinus tube often becomes greatly coiled (fig. 107). This region is more or less separated by a constriction at its posterior end and sometimes appears to be partially divided near its middle. The penislike sinus tube is very evidently flexible and capable of protrusion; its tip end can usually be seen in this saclike portion of the sac; in a few specimens it is extended into the next anterior and more muscular region. This muscular region of the sac is long and straight, extending almost to the genital pore. It measures 0.127 to 0.170 in length. The fourth region is a short, thin-walled, tubular genital atrium leading to the genital pore.

Ovary ovoid, transversely extended, not far posterior to testes, about in middle of hindbody. Vitelline lobes fairly thick and of medium length, thickened at tips with some slight indication of branching (fig. 105). Seminal receptacle very small, embedded in Mehlis' gland. Laurer's canal lacking. Uterus may or may not send a loop into ecsoma. Eggs thin shelled, elongate, 14 to 17 by 6 to 8 μ . Eggs were seen within the ductus hermaphroditicus and even in the sinus sac outside the ductus. Excretory vesicle forking at base of seminal vesicle; branches uniting dorsal to pharynx.

GENERIC DIAGNOSIS OF ELYTROPHALLUS

Smooth-bodied, tailed Hemiuridae. Subfamily Dinurinae. Acetabulum large, in anterior half of body. Genital pore ventral to oral sucker.

Seminal vesicle ovoid, thick walled, not distinctly divided. Pars prostatica fairly short, sinuous, with prostatic cells moderately developed. Ductus hermaphroditicus exceedingly long with 4 regions more or less evident: a long, straight posterior portion; a thinner-walled distensible portion within which the sinus tube is usually coiled; a straight, very muscular portion within which the sinus tube may be extended; and a thin-walled genital atrium. Vitellaria of 7 rather thick tubes, thicker terminally. Small seminal receptacle present; Laurer's canal absent. Branches of excretory vesicle uniting dorsal to pharynx. Type species: *E. mexicanus*.

The name *Elytrophallus* is from *elytro* (= sheath) and *phallus* (= penis). It refers to the sheathlike manner in which the sinus sac encloses the sinus tube. The name *mexicanus* is for the locality.

Discussion. This trematode reveals a combination of characters known in several genera. The smooth body, the rather small tail appendage, and the form of the vitellaria all suggest the genus *Sterrhurus*. But the seminal vesicle, the tubular pars prostatica, and especially the long tubular form of the sinus sac are very different from *Sterrhurus*. *Tubovesicula* Yamaguti, 1934 has a smooth body but a larger tail, a very long pars prostatica, and a short pyriform sinus sac. These differences also hold for *Culpenurus* Srivastava, 1935, a genus which probably should be considered a synonym of *Tubovesicula*. *Lecithocladium* Lühe has a long slender sinus sac and a genital pore near the mouth, but it has a ringed body, long tubular vitellaria, and usually a very long pars prostatica. *Dinurus* Looss has a ringed body, long tubular vitellaria, distinctly tripartite seminal vesicle, and lacks the ventral spherical swelling of the esophagus. *Elytrophallus* is similar to *Erilepturus* Woolcock, 1935 in some respects, especially in the seminal vesicle and in that the ringed condition is practically lacking in *Erilepturus*. *Erilepturus*, however, has a more posterior acetabulum, a more posterior genital pore, a different pars prostatica which is preacetabular and separated from the seminal vesicle, and a shorter sinus sac. The sphincters of the sinus sac figured by Woolcock seem to divide the common genital tube into somewhat similar but less evident regions, as have been noted in *Elytrophallus*.

Elytrophallus is perhaps most like *Erilepturus*. Woolcock correctly minimizes the subfamily significance of cuticular plications or rings. As a consequence it becomes increasingly difficult to separate the *Sterrhurinae* from the *Dinurinae*. *Elytrophallus* is considered in the subfamily *Dinurinae* chiefly because of the length of the sinus tube, the tubular pars prostatica, and the shape and position of the seminal vesicle.

Mecoderus oligoplitis, new genus, new species

(Plates 46 and 47, figs. 108-110)

Host: *Oligoplites saurus* (Bloch and Schneider)

Location: Stomach and gills

Locality: San Francisco, Ecuador

Number: 10 specimens were collected, 8 from the stomach of one fish, 2 from the gills of another

SPECIFIC DIAGNOSIS OF MECODERUS OLIGOPLITIS

Smooth-skinned, tailed hemiurids with much narrowed, elongated anterior region and short, wide, plump posterior region containing most of reproductive organs. Total length of body including extended portion of ecsoma 5.872 to 7.425; greatest width 0.600 to 1.309. Forebody very short; equally wide, 0.622 to 0.877 in length or somewhat less than $\frac{1}{10}$ total body length. Anterior portion of body slender, flexible, very long, 3.105 to 4.455 in length, always more than half total body length, about equally wide, widening abruptly to form body proper; distance from acetabulum to wide portion of body 2.025 to 3.240. Wide portion of body 1.087 to 2.025. Ecsoma partially extended in most specimens (from 0.810 to 1.433) but always at least partially retracted (wholly so in one specimen). Oral sucker subterminal, large, somewhat longer than wide; 0.277 to 0.420 in transverse diameter. Several pairs of papillae around oral aperture. Posterior edge of mouth with conspicuous lobes, 3 median lobes evident, a smaller lobe on each side sometimes evident; total: 5 lobes. Acetabulum 0.337 to 0.450 in diameter; at least slightly larger than oral sucker; ratio may be up to 3:4.

Pharynx 0.202 to 0.225 in length by 0.165 to 0.195 in width; lateral thickenings of pharynx wall at anterior edge; esophagus subcircular, capable of inflation into a saclike outpocketing or esophageal diverticulum so varying in appearance as to suggest it is an inconstant structure (it is probably an elastic bulb capable of expansion); ceca bow forward slightly, then extend, rather close together, to extreme posterior end of ecsoma, considerably wrinkled and folded in the partially extended ecsoma.

Genital pore an inconspicuous transverse slit opposite middle of pharynx. Testes smooth, subtriangular to ellipsoidal, close together, oblique, at anterior end of widened portion of body. Seminal vesicle a thin-walled sac, immediately anterior to and overlapping anterior testis, at anterior border of widened portion of body. Pars prostatica, surrounded by prostatic cells, coiled or sinuous, rather short, extending only a short distance

into narrow part of body. Vas deferens, without gland cells, very long and straight, extending entire length of narrow part of body (1.2 to 3) to near sinus sac; near its anterior end it is again surrounded by gland cells forming a second pars prostatica. Or, expressed differently, the pars prostatica and prostate gland are divided into two parts by a very long vas deferens. Sinus sac muscular but thin walled, subcylindrical, preacetabular; genital atrium lacking or very small.

Ovary median, kidney shaped, transversely extended, immediately posterior to testes. Mehlis' gland at its posterior border. Seminal receptacle large, dorsal and posterior to Mehlis' gland. Laurer's canal lacking. Vitelline glands in the form of long coiled tubes, 4 on one side, 3 on the other; chiefly lateral but partly ventral; extending in middle half of widened part of body. Uterus coiling backward into ecsoma, then forward; coils in widened body chiefly lateral, extending between vitellaria; coils gradually straighten along left side of seminal vesicle; uterus narrow and straight throughout the long narrow part of body, entering base of sinus sac; metraterm not differentiated. Eggs thin shelled, ovoid, 17 by 8.5 to 10 μ . Excretory vesicle forking anterior to testes; branches uniting dorsal to pharynx.

The name *mecoderus* is from *meco* (= long) and *derus* (= neck). The name *oligoplitis* is for the host.

GENERIC DIAGNOSIS OF MECODERUS

Fairly large Hemiuridae with ecsoma, without cuticular denticulations. Body much elongated with narrow, flattened anterior necklike region and a shorter, widened, plump posterior region containing reproductive organs and ecsoma. Suckers large, close together, distant from reproductive organs. Seminal vesicle a simple thin-walled sac. Prostatic portion of duct divided into a rather short, coiled pars prostatica near the testes and a shorter pars prostatica near the sinus sac, these two regions separated by a very long vas deferens. Vitelline glands tubular and coiled. Seminal receptacle large; Laurer's canal lacking. Sinus sac preacetabular, simple, rather small and weak. Crura of excretory vesicle uniting dorsal to pharynx. Type species: *Mecoderus oligoplitis*.

Comparisons. This hemiurid is unusual in its peculiar body form and in the long stretch of the vas deferens between the testes and the sinus sac. The lobed posterior border of the mouth is also peculiar. The trematode is to be compared to other smooth, tailed forms with tubular vitellaria (i.e., *Stomachicola* Yamaguti, 1934; *Erilepturus* Woolcock, 1935; and

Tubovesicula Yamaguti, 1934). Yamaguti has described a species of *Lecithocladium* without denticulations, but even so the genus differs from *Mecoderus* in body form, male duct, location of genital pore, and form of sinus sac. *Erilepturus* has suckers distant from one another and a tripartite seminal vesicle as well as a different body shape. *Tubovesicula* has a different body shape, a long continuous prostatic gland, tubular seminal vesicle, separated testes, and shorter vitelline lobes. It is, however, probably the most closely related genus. *Stomachicola* is very different in body form, development of ecsoma, and location of the gonads in relation to the acetabulum.

***Sterrhurus fusiformis* (Lühe, 1901)**

Host: *Muraena clepsydra* Gilbert

Location: Stomach

Locality: Cape Elena, Ecuador

Number: Several specimens in both of 2 hosts examined

These rather large sterrhurids (3.051 to 4.434 in length by 0.864 to 1.067 in width) agree almost perfectly with specimens from *Gymnothorax funebris* Ranzani and *Gymnothorax morinza* (Cuv.) at Tortugas. Linton (1910) reported them from Tortugas. Both the Atlantic and Pacific forms agree in detail with Looss' (1907) description of *S. fusiformis* from *Conger conger* in the Mediterranean except that the eggs are slightly smaller and more narrow. Specimens from both Tortugas and Ecuador have eggs measuring 14 to 18 by 9 to 12 μ as compared with 20 to 25 by 17 to 19 μ reported by Looss.

***Lecithochirium microstomum* Chandler, 1935**

(Plate 47, figs. 111-113)

Hosts: *Calamus brachysomus* (Lockington)

Caulolatilus sp.

Euthynnus alletterata (Raf.)

Paralabrax humeralis (Cuv. and Val.)

Paranthias furcifer (Cuv. and Val.)

Location: Stomach

Localities: Charles Island, Albemarle Island, James Island, Galapagos

Number: This parasite was collected in small numbers from 6 specimens of *P. humeralis*, from 4 specimens of *P. furcifer*, from 1 specimen of *C. brachysomus*, from 1 specimen of *E. alletterata*, and from one specimen of *Caulolatilus* sp.

Discussion. These specimens were all assigned to a single species in spite of some differences noted in shape and size of the eggs. However, all gradations between the short plump eggs and the narrow bowed eggs could be found in different specimens (fig. 113). Sample measurements (in μ) from different specimens including extremes are: 17 by 14, 19 by 12, 22 by 15, 23 by 13, 22 by 12, 24 by 14, 25 by 11, 25 by 12, 26 by 14, 26 by 13. In the absence of other constant or significant differences these trematodes were considered a single species, *L. microstomum*. This species is easily distinguished from 2 other Lecithochirium species collected, viz., *L. magnaporum* and *L. muraenae*.

While my specimens are somewhat smaller than those described for *L. microstomum* and the egg size somewhat larger, because of the variation in these characters the differences were not considered specific. The details of the sinus sac, the bipartite prostatic vesicle, and the vitelline lobes are as in *L. microstomum*. The United States National Museum kindly loaned the type and paratype specimens of *L. microstomum*. Chandler (1935) states the egg size as 16 by 12 μ , but this seems to vary up to 19 by 10 to 12 μ .

The question of sucker ratio does not help much in distinguishing *L. microstomum*, *L. synodi* Manter, 1931, and my specimens. Chandler gives 1:2.5 to 1:2.8 for *L. microstomum* and in the type specimen it is 1:2.5. Over a dozen specimens of *L. synodi* show a ratio usually about 1:1.33 but ranging from only about 1:2 up to 1:2.5. In other words, the ratio in *L. synodi* ranges from 1:2.5 somewhat downward, while in *L. microstomum* it is 1:2.5 to somewhat above. My Galapagos material is more like *L. synodi*, the sucker ratio being usually about 1:1.33, but it may be fully 1:2.5 or slightly above. Thus, all three species may meet at a sucker ratio of 1:2.5. *L. magnaporum* has a fairly distinctly smaller ratio varying on either side of 1:2, while *L. japonicum* is distinctly different in its 1:3 or 1:4 ratio. *L. exodicum* is like *L. microstomum* in this ratio.

A restudy of specimens of *L. synodi* reveals an error in the description in that a bipartite prostatic vesicle is present. It is, however, usually very indistinct. The anterior portion is very small and cylindrical, usually appearing rudimentary and sometimes appearing absent. The posterior portion is larger and cylindrical but smaller than in *L. microstomum*. In spite of the removal of these supposed differences between *L. synodi* and *L. microstomum*, I believe that *L. synodi* is specifically distinct. It has a sinus sac that is almost cylindrical and not enlarged at its base. Its ductus

hermaphroditicus is very wide and more muscular. Its eggs are smaller and wider, and the cell pad around the presomatic pit is much better developed. *L. synodi* does not seem to possess the sphincter of the metra-term described for *L. microstomum* and *L. japonicum*.

***Lecithochirium magnaporum*, new species**

(Plate 47, figs. 114-116)

Hosts: *Paralabrax humeralis* (Cuv. and Val.)

Euthynnus alletterata (Raf.)

Seriola dorsalis (Gill)

Epinephelus sp. ?

Location: Stomach

Locality: Galapagos Islands (Charles Island, Albemarle Island, Hood Island)

Number: 20 specimens were collected from 5 hosts. A single specimen in *Seriola dorsalis*, in *Epinephelus* (?), and in one *Paralabrax humeralis*. In the other 2 collections the trematode occurred with *Lecithochirium microstomum*. 6 specimens were collected from one *Paralabrax humeralis* and 11 specimens from *Euthynnus alletterata*.

SPECIFIC DIAGNOSIS OF LECITHOCHIRIUM MAGNAPORUM

Length 1.404 to 1.728; greatest width 0.337 to 0.450. Oral sucker 0.135 to 0.150 in diameter; acetabulum 0.262 to 0.292 in diameter; sucker ratio approximately 1:2, or acetabulum may be slightly less than twice diameter of oral sucker. Forebody 0.240 to 0.420. Ecsoma almost always completely retracted. Pharynx usually slightly wider than long; 0.054 to 0.075 in length, 0.063 to 0.073 in width; esophagus very short; ceca usually not entering ecsoma. Presomatic pit muscular, its aperture a transverse slit. Genital pore opposite base of pharynx, large, conspicuous; with a narrow transverse slit similar to aperture of pit; provided with conspicuous radial muscles. Testes diagonally oblique, just posterior to acetabulum. Seminal vesicle tripartite, overlapping acetabulum. Prostatic cells surrounding male tube (pars prostatica) just before it enters sinus sac. Sinus sac thin walled, very large, wider than long, 0.060 to 0.102 in length, 0.094 to 0.153 in width. Prostatic vesicle pyriform, entirely inside sinus sac. Ovary transversely extended. Vitelline lobes digitiform. Uterus may, but usually does not, enter ecsoma. Eggs tapering somewhat toward each end but more abruptly toward one end so that they are widest toward one end of the middle; size 15 to 19 by 8 to 9 μ .

The name *magnaporum* refers to the large, conspicuous genital pore.

Comparisons. Although the same size as *Lecithochirium microstomum* with which it frequently occurs, *L. magnaporum* can be identified by its large genital pore, very large sinus sac, and smaller eggs with pointed ends. The ventral sucker is slightly smaller and the prostatic vesicle is not bipartite. It differs from *L. exodicum* in longer vitelline lobes and smaller body size. It differs from *L. japonicum* in genital pore, size and shape of the sinus sac, absence of external prostatic vesicle, and much smaller ventral sucker.

***Lecithochirium muraenae*, new species**

(Plate 48, figs. 117, 118)

Host: *Muraena clepsydra* Gilbert

Location: Stomach

Locality: Cape Elena, Ecuador

Number: 2 specimens of this moray were examined. Several specimens of what seemed to be the same hemiurid occurred in each host. The parasites were placed in the same vial. Upon study 3 specimens proved to be *L. muraenae*, the others *Sterrhurus fusiformis*. The 2 species of parasites probably can occur together in this host.

SPECIFIC DIAGNOSIS OF LECITHOCHIRIUM MURAENAE

Body rather thick and robust, 3.684 to 5.359 in length by 0.958 to 1.120 in greatest width (near middle). Ecsoma glandular, much folded, retracted in every specimen, much as in *Sterrhurus fusiformis*. Oral sucker subterminal, surmounted by fleshy lip, somewhat wider than long, 0.300 to 0.375 in transverse diameter; acetabulum large, circular, 0.715 to 0.883 in diameter; sucker ratio approximately 3:7. Forebody 0.756 to 1.188. Presomatic pit about midway between suckers, suckerlike, 0.225 to 0.255 in diameter, with radial and circular muscles, nonglandular, with small irregularly shaped pore. Genital pore median, a short distance anterior to presomatic pit. Pharynx 0.120 to 0.170 in length by 0.075 to 0.120 in width; esophagus apparently lacking; ceca slightly sinuous, extending to level of base of ecsoma but not entering ecsoma. Testes oblique (almost symmetrical), immediately posterior to acetabulum, separated by uterus. Seminal vesicle thin walled, not distinctly divided into 3 parts, making 3 more or less distinct loops before straightening to enter sinus sac, thus being approximately S shaped; posterior end of seminal vesicle

overlapping acetabulum. Prostate gland conspicuous, fan shaped, at base of sinus sac. External prostatic vesicle lacking. Sinus sac thin walled, very broad, filling most of the intercecal space anterior to acetabulum, tapering very little anteriorly and still less posteriorly, both ends broadly rounded, 0.270 to 0.300 in length by 0.225 to 0.255 in width. Spherical, internal, prostatic vesicle, near base of sinus sac. Genital sinus very wide; its wall thrown into peculiar longitudinal folds (fig. 118); when contracted, almost as wide as long. Most of sinus sac filled with very thin-walled, transparent cells. Anterior end of sinus may be protruded lobelike from genital pore.

Ovary smooth, ovoid, to the left, about midway between acetabulum and base of ecsoma. Vitelline lobes short and thick, almost spherical, each narrowed at its base; group of 3 facing laterally; group of 4 facing ventrally. Uterus not extending beyond base of ceca, not entering ecsoma; surrounded by gland cells opposite posterior half of acetabulum; metratrum opposite anterior half of acetabulum, joining sinus sac just anterior to prostatic vesicle. Eggs thin shelled, 15 to 19 by 10 to 12 μ . Excretory vesicle sinuous, forking between testes just posterior to acetabulum, branches uniting dorsal to pharynx.

The name *muraenae* is for the host.

Comparisons. The sharply defined, muscular, nonglandular presomatic pit is different from such organ found in other species of the genus. Other distinctive characters are the large size and great width of the sinus sac and the peculiar longitudinal folds or rugae in the walls of the sinus. The vitelline lobes are shorter than in *L. synodi* or *L. microstomum*.

***Derogenes varicus* (O. F. Müller, 1784)**

Hosts: *Paralabrax humeralis* (Cuv. and Val.)

Cratinus agassizii Steindachner

Location: Stomach

Locality: Tagus Cove, Albemarle Island, Galapagos

Number: One specimen in each of the above hosts

These 2 new host records for this cosmopolitan trematode bring its total known hosts to at least 59. Although the distribution of *D. varicus* is wide, the species has not yet been reported from tropical waters except at some depth. Manter (1934, p. 318) suggests that temperature is an important factor in its distribution, since he found it rather common at Tortugas at depths of 190 fathoms and more, but did not find it in

shallow water. The above records do not constitute clear evidence against such a view, since the temperature of the water at Tagus Cove is approximately 68° F.

A specimen of a *Dero­genes* species which may be *D. varicus* was collected from an unidentified flounder dredged at Bahia Honda, Panama. The exact depth from which this fish was secured is not available, but no very deep hauls were made. If this specimen actually is *D. varicus*, it occurs in rather warm water. However, eggs in this specimen were 68 to 69 by 27 to 29 μ , which is markedly larger than the 51 to 56 by 29 to 31 size of specimens from Tagus Cove. Egg size in *D. varicus* is evidently variable, records varying from 51 to 66 by 28 to 40 μ . Since the Panama specimens (2) exceed even these limits, it is identified merely as *Dero­genes* species.

***Theletrum lissosomum*, new species**

(Plate 48, figs. 119-121)

Host: Unidentified angelfish

Location: Stomach

Locality: Socorro Island, Mexico

Number: 7 from one fish, one from another

SPECIFIC DIAGNOSIS OF THELETRUM LISSOSOMUM

Body smooth, elongate, cylindrical, without ecsoma, with ventral papillae. Length 2.916 to 3.699; greatest width 0.216 to 0.499. Forebody 0.607 to 0.712 (about $\frac{1}{5}$ body length), tapering slightly to a rounded end. Hindbody almost equally wide, posterior end bluntly rounded, almost truncate. Oral sucker subspherical, 0.180 to 0.195 in transverse diameter. Acetabulum 0.255 to 0.300 in transverse diameter, somewhat longer than wide, with longitudinal aperture. Sucker ratio approximately 2:3. Pharynx 0.085 to 0.111 in length by 0.080 to 0.099 in width; esophagus short, with small ventrally directed esophageal diverticulum; intestinal bifurcation nearer oral sucker; ceca rather wide, extending to extreme posterior end of body beyond uterine coils. Genital pore median, varying from opposite middle of pharynx to opposite intestinal bifurcation. Testes globular, oblique, ventral to ceca, about halfway between acetabulum and ovary, separated by uterus. Seminal vesicle inconspicuous, tubular, sinuous; its posterior end near anterior edge of acetabulum. Prostatic gland well developed; pars prostatica almost straight, shorter than seminal vesicle, near intestinal bifurcation. Sinus

sac small, cylindrical to pyriform in shape; its tip can be projected as a small genital papilla into a very shallow genital atrium (fig. 120). Male duct and uterus entering sac separately, uniting near middle of sac to form the short, tubular genital sinus (fig. 120).

Ovary transversely extended, more or less median, about in middle of hindbody. Seminal receptacle chiefly anterior to ovary. Three compact vitellaria immediately posterior to ovary; anterior pair side by side, connected by a narrow isthmus; single, larger, bilobed posterior vitellarium directly posterior to anterior pair and more or less median. Uterus coiling backward some distance but not reaching posterior end of body; nearly straight in region of acetabulum. Eggs thin shelled, elongate, 26 to 34 by 9 to 15 μ . Excretory pore ventral, a short distance in front of posterior end of body; branches of vesicle unite dorsal to oral sucker.

The name *lissosomum* is from *lisso* (= smooth) and *somum* (= body) and refers to the absence of the ventral papillae.

Discussion. The genus *Theletrum* was named by Linton in 1910 for a single specimen of a trematode collected from the black angelfish, *Pomacanthus arcuatus*, from Tortugas, Florida. A few specimens have been collected there by the writer. The genus was named for the peculiar cutaneous papillae posterior to the acetabulum. These are lacking in *T. lissosomum* and are considered here as being a specific rather than a generic character. *T. lissosomum* is fundamentally similar to *T. fusti-forme* especially in the reproductive systems. Linton's description and figure are incorrect in the so-called "cirrus sac," which is actually a typically hemiurid sinus sac. The 3 vitellaria and their arrangement are probably prime generic characters, although in my Florida material these vitellaria are sometimes so crowded together as to appear like one.

The following generic diagnosis is proposed.

GENERIC DIAGNOSIS OF THELETRUM LINTON, 1910

Elongate, cylindrical hemiurids, without ecsoma; body smooth or with ventral papillae, without denticulations, posterior end broadly rounded or truncate. Acetabulum anterior to midbody. Intestinal ceca extending to posterior end of body. Genital pore near intestinal bifurcation. Sinus sac cylindrical or pyriform; seminal vesicle tubular, preacetabular; testes diagonal, separated from one another and from the ovary by the uterus. Ovary posttesticular; seminal receptacle present; vitellaria postovarian, 3 in number, 2 side by side and one median and posterior.

Eggs without filaments. Excretory pore ventral, excretory crura uniting near oral sucker. Type species: *T. fustiforme* Linton, 1910.

This genus is to be classified in the subfamily Derogeninae.

T. lissosomum is very clearly distinct from *T. fustiforme*. Among the differences are: sucker ratio 2:3 rather than 1:2, more anterior ovary, smaller sinus sac, larger prostatic gland, less coiled and smaller seminal vesicle.

Although the two species occur in different oceans, both occur in angelfishes.

***Theletrum gravidum*, new species**

(Plate 49, figs. 122, 123)

Host: *Abudefduf saxatilis* (Linn.)

Location: Usually in the stomach, sometimes in the intestine

Localities: Socorro and Clarion islands, Mexico

Number: Collected from 4 hosts; 2 to 5 specimens in each host

SPECIFIC DIAGNOSIS OF THELETRUM GRAVIDUM

Body smooth, cylindrical, rounded at each end, somewhat more tapering at anterior end, posterior end usually broadly rounded, 1.566 to 2.443 in length by 0.465 to 0.667 in greatest width. Forebody 0.405 to 0.547 or about $\frac{1}{4}$ to $\frac{1}{5}$ body length. Oral sucker subspherical, 0.150 to 0.202 in diameter. Acetabulum 0.262 to 0.375 in transverse diameter, slightly longer than wide, slightly less than twice diameter of oral sucker, with longitudinal aperture. Pharynx subspherical, 0.068 to 0.076 long by 0.066 to 0.082 wide; esophagus represented by a spherical ventral diverticulum; intestinal diverticulum nearer oral sucker; ceca wide, extending to near posterior end of body but not posterior to uterus. Genital pore median, opposite esophagus. Testes rounded, diagonal, just anterior to middle of hindbody, separated by and largely covered by uterus. Seminal vesicle tubular, sharply bent once, not quite reaching acetabulum. Prostatic gland compact, subspherical, about same length as sinus sac. Short prostatic vesicle just outside sinus sac. Sinus sac more or less cylindrical, inconspicuous, opposite intestinal bifurcation. Ovary just posterior to middle of hindbody, ovoid, transversely extended. Seminal receptacle large, subspherical, partly anterior and partly dorsal to ovary. Three compact vitellaria as in other species of the genus; posterior vitellarium unlobed. Uterus voluminous with saclike coils too wide and irregular to be traced, covering most organs and reaching to tips of ceca or beyond. Eggs

elongate, 24 to 29 by 10 to 12 μ , usually about 25 by 10 μ . Excretory pore subterminal and ventral; branches of vesicle uniting dorsal to esophagus.

The name *gravidum* refers to the extensive development of the uterus.

Comparisons. This species is the third to be named in the genus. It is more like *T. lissosomum* than like *T. fustiforme*. It differs from *T. lissosomum* in smaller size, in extent of the uterus, in more compact prostate gland, in unlobed posterior vitellarium, in shape of the seminal vesicle, and in slightly smaller eggs.

T. lissosomum and *T. gravidum* are both from Socorro Island, Mexico, while *T. fustiforme* is from Florida. *T. gravidum* was not collected from the Galapagos Islands.

Aponurus trachinoti, new species

(Plate 49, figs. 124, 125)

Host: *Trachinotus rhodopus* (Gill)

Location: Stomach

Locality: Tenacatita Bay, Mexico

Frequency: One specimen collected from one of hosts examined

The single specimen is a typical member of the genus *Aponurus*, and only a diagnosis is necessary for its characterization.

DIAGNOSIS OF APONURUS TRACHINOTI

The body is elongate, subcylindrical, 1.120 by 0.262; both ends rounded and somewhat tapered, but forebody more tapered than hindbody. Oral sucker 0.088; acetabulum 0.155; ratio not quite 1:2. Forebody (extended) 0.352 or almost $\frac{1}{3}$ body length. Genital pore opposite posterior half of pharynx. Pharynx 0.042 long, 0.051 wide. Esophagus short; ceca extending only slightly beyond the vitellaria. Testes oblique almost tandem a short distance posterior to acetabulum. Seminal vesicle an elongate, almost straight tube, 0.102 in length; pars prostatica curved dorsally in a bow; sinus sac pyriform, 0.093 long, 0.051 wide. Ovary about in middle of hindbody; vitellaria in a group of 4 and a group of 3 rounded masses; seminal receptacle medium sized, anterior to ovary, between ovary and posterior testis; uterus filling most of hindbody; eggs pyriform, widest at or near one end, tapering almost to a point at the other end, 25 μ long, 10 μ greatest width.

The specific name is for the host.

Comparisons. This species of *Aponurus* is unique in the size and especially in the shape of the eggs. The eggs of *A. sphaerolecithus* are more

than twice as big. *A. trachinoti* seems to be most similar to *A. laguncula*, but the eggs are not nearly so wide and have a different shape, and the pars prostatica is somewhat longer and curved. *A. rhinoplagusiae* has a larger seminal receptacle, 1:3 sucker ratio, larger eggs, and longer ceca. *A. brevicaudatus* remains distinct in posterior ovary and vitellaria and in position of genital pore. *A. intermedius* has different eggs, more spherical sinus sac, and more symmetrically placed testes.

A. vitellograndis Layman, 1930 needs a more complete description. Because an ecsoma was figured and described, the species was considered in the genus *Sterrhurus* by Manter (1934). Yamaguti has collected it and reports an ecsoma lacking. He states it belongs in the genus *Aponurus*. *A. trachinoti* differs from it in the same way as from *A. laguncula*. Layman figures the vitellaria of *A. vitellograndis* as pointed medianly, more as in *Lecithaster*. The shape and size of the vitellaria seem to be the only differences between *A. laguncula* and *A. vitellograndis*. The two species should be compared more fully.

Leurodera pacifica, new species

(Plate 49, figs. 126, 127)

Hosts: *Anisotremus interruptus* (Gill)
Anisotremus scapularis (Tschudi)

Location: Stomach

Locality: Galapagos Islands (Albemarle, James, Charles islands)

Number: From one to 5 specimens in each of 4 hosts

SPECIFIC DIAGNOSIS OF LEURODERA PACIFICA

Body tongue shaped, somewhat flattened, broadest near posterior end, length 1.215 to 2.632, greatest width 0.513 to 1.012. Forebody tapering, 0.540 to 1.013; posterior end of body broadly rounded. Oral sucker 0.157 to 0.280, subcircular, subterminal. Acetabulum at or slightly posterior to midbody, 0.337 to 0.637 in diameter, aperture circular. Sucker ratio approximately 1:2 or 2:5. Pharynx 0.102 to 0.153 in length by 0.078 to 0.133 in width; esophagus very short (often not evident); ceca more or less undulating, extending to posterior end of body, bowing outward near acetabulum, inward at testicular level and again outward near widest portion of body, bending medianly toward one another near posterior end. A pair of conspicuous muscle bands extends from sides of pharynx diagonally outward and backward. Another shorter pair extends

diagonally backward from sides of oral sucker. Genital pore a muscular, transverse slit opposite base of pharynx.

Testes rounded, smooth, symmetrical, far apart, wholly or chiefly extracecal, a short distance posterior to acetabulum. Seminal vesicle sometimes inconspicuous, a more or less straight tube extending from pars prostatica to acetabulum. Prostate gland large, free in parenchyma, filling intercecal space from immediately dorsal and posterior to sinus sac almost halfway to acetabulum, surrounding a finely tubular pars prostatica and small spherical prostatic vesicle. Sinus sac large, ovoid, thick walled, a little larger than pharynx, overlapping intestinal bifurcation, containing in its basal half a tubular, thick-walled portion of the genital sinus, in its anterior half a more or less spherical portion of the duct with radiating muscles.

Ovary globular, smooth, median, halfway between testes and posterior end of body. Flask-shaped seminal receptacle to right of ovary, extending anteriorly. Mehlis' gland just posterior to seminal receptacle at right posterior border of ovary. Two large, compact vitellaria, smooth or with only slightest indication of lobing, directly to the right of ovary, one diagonally posterior to the other; anterior vitellarium more globular and chiefly extracecal, partly ventral to right cecum; posterior vitellarium more elongate, median to cecum, and largely posterior to ovary. Uterus extending backward to a level opposite posterior edge of hind vitellarium, then forward in transverse coils, straightening opposite acetabulum, again coiling between acetabulum and sinus sac. Eggs 31 to 37 by 10 to 15 μ .

Excretory pore subterminal; excretory vesicle at first wide, then abruptly narrowing and bending to the left as if it were a left branch, then extending forward dorsally, forking opposite anterior ends of testes. The two crura diverge to pass lateral to acetabulum. Anterior to acetabulum they become greatly inflated and convoluted, filling body lateral to ceca and overlapping ceca. One of these folds on each side is longer than the others and corresponds to the pronounced bend of these organs in *Leurodera decora*. The crura unite dorsal to the oral sucker.

The name *pacifica* is for the locality.

Comparisons. This species is very similar to the Atlantic form and is the only other species yet known in the genus. It differs from *L. decora* in more broadly rounded posterior end, more anterior genital pore, larger prostate gland, in slightly larger acetabulum, in unlobed vitellaria, in the intercecal position of the posterior vitellarium, and in slightly smaller eggs. While the crura of the excretory vesicle are more inflated in *L.*

pacifica, both species show at least one conspicuous loop of each crus in the forebody.

The two species occur in closely related hosts in the two oceans and can be considered as examples of "twin species."

The only other species in the genus *Leurodera* is *L. decora* Linton, 1910, common in *Haemulon* species at Tortugas, Florida. This species has been studied by the writer and since some details of Linton's description are incorrect and no diagnosis for the genus has been given, the following diagnosis of *Leurodera* is proposed.

LEURODERA Linton, 1910

Smooth-bodied hemiurids, without ecsoma, subfamily Derogeninae. Acetabulum in or posterior to midbody. Genital pore near intestinal bifurcation. Testes symmetrical, far apart, largely extracecal. Sinus sac ovoid, muscular, containing a muscular ductus hermaphroditicus and genital atrium. Prostatic vesicle external; seminal vesicle tubular. Ovary median, posttesticular; seminal receptacle present; vitellaria compact, oblique, to right of ovary; uterus extending a short distance posterior to ovary but not posterior to posterior vitellarium; eggs without filament. Excretory vesicle forking posterior to acetabulum; the excretory crura folded in loops anterior to acetabulum, uniting dorsal to oral sucker. Type species: *Leurodera decora* Linton, 1910.

Gonocercella pacifica, new genus, new species

(Plate 49, fig. 128)

Host: *Trachinotus rhodopus* (Gill)

Location: Stomach

Locality: Port Utria, Colombia

Frequency: A single specimen from one of the hosts examined

SPECIFIC DIAGNOSIS OF GONOCERCELLA PACIFICA

Body cylindrical, thick skinned, smooth except for flexure wrinkles, rounded at each end, tapering only slightly from the acetabular region, ecsoma lacking. Acetabulum posterior to midbody. Total length of body 3.604, of which 2.173 is forebody (anterior to acetabulum); greatest width, at acetabular level, 0.972. Oral sucker subterminal, subspherical, slightly longer than wide, 0.405 in transverse diameter. A distinct large papilla or small lobe projects on the ventral surface of the anterior

end immediately anterior to oral sucker. Acetabulum subspherical, 0.622 in diameter; sucker ratio approximately 2:3. Pharynx close to oral sucker, 0.165 long and 0.150 wide; short esophagus bearing a rather long ovoid ventral diverticulum; ceca extending rather close together to posterior end of the body where they do not unite. Genital pore median, a short distance posterior to intestinal bifurcation. A nipplelike genital papilla can be seen within the genital atrium. It is actually the tip of a large muscular genital cone measuring 0.119 in length and 0.093 at its broad base. (This genital cone is similar to that found in *Derogenes* and related genera.) Prostatic vesicle very large, ovoid, 0.240 long and 0.180 wide, largely filling intercecal space at that level, surrounded by a few prostatic cells and serving as both prostatic vesicle and pars prostatica; seminal vesicle a coiled tube overlapping posterior part of prostatic vesicle, extending only a short distance posterior to it. It makes one diagonal hairpin loop and is bent sharply at each end. The testes are large, immediately postacetabular, diagonal, in contact with one another, overlapping at least one cecum. Ovary immediately posttesticular, somewhat wider than long, unlobed, overlapping both ceca ventrally; vitellaria two small compact masses, unlobed, immediately postovarian, side by side, overlapping the ceca ventrally; uterus not extending posterior to ovary, in short more or less lateral coils, overlapping the ceca at first dorsally then ventrally; seminal receptacle apparently lacking; normal eggs not present in type specimen, very thin-shelled eggs of extremely variable size present, no filaments visible, probable usual size about 34 by 15 μ . Crura of excretory vesicle unite dorsal to pharynx.

This trematode is unique especially in the male terminal genital organs and seems to warrant a new genus of the family Hemiuridae, subfamily Derogeninae. The following diagnosis is proposed.

GENERIC DIAGNOSIS OF GONOCERCELLA

Smooth bodied, cylindrical hemiurids of fairly large size, without ec-soma; acetabulum posterior to midbody; ceca do not unite; genital pore near or posterior to intestinal bifurcation; testes preovarian, postacetabular, diagonal, close together; seminal vesicle a coiled tube far anterior to acetabulum; prostatic vesicle very large, surrounded by prostatic cells; genital cone large and muscular, projecting into a spacious genital atrium; ovary ovoid, posttesticular; vitellaria two unlobed masses, postovarian; seminal receptacle lacking; uterus not extending posterior to ovary. Type species: *Gonocercella pacifica*.

The name *Gonocercella* indicates the resemblance of the genus to *Gonocerca* Manter, 1925. The specific name refers to the geographical region.

Discussion. The most distinctive characters of this genus are the large prostatic vesicle and location of the prostatic gland around it, and the coiled tubular seminal vesicle. The genus differs from *Derogenes* in these characters and in the preovarian uterus. It differs from *Progonus* in that the ceca do not unite, from *Liopyge* in the preovarian position of the testes, from *Genarchopsis* in the separated ceca and nonfilamented eggs. It has the esophageal pouch (at least, in *G. pacifica*) of *Ophiorchis*, but the ceca do not unite and the eggs are nonfilamented. In general appearance it is much like *Gonocerca*, especially in the short hindbody crowded with reproductive organs and in the preovarian uterus. But in *Gonocerca* the ovary is pretesticular, and the seminal vesicle and prostatic vesicle are different.

At least one other species of *Gonocercella* occurs in the Atlantic. Linton in 1905 described a peculiar distome from *Trachinotus carolinus* at Beaufort, North Carolina (Linton, 1905, p. 367 and fig. 204). He did not name this trematode but referred to it as "*Distomum* sp." Linton confused gland cells in the cortical parenchyma as vitellaria, and classification of the species has been impossible from his description. His figure clearly shows the large prostate gland, coiled seminal vesicle, and the same arrangement of organs (except the vitellaria) found in *Gonocercella*. The "lobed" ovary described by Linton evidently is an ovary with closely applied vitellaria. The writer has collected at Tortugas, Florida, from *Monacanthus hispidus* (Linn.) a specimen (not quite mature) very probably of the same species as Linton's. Its immaturity is perhaps due to the probable abnormal host. In any case, the Atlantic specimens are congeneric with but specifically distinct from the Pacific form. The name *Gonocercella atlantica*, new species is proposed for Linton's "*Distomum* sp." (Linton 1905, p. 367) with the specific characters noted by him. A further account of this species will be given in a later paper.

***Hirudinella clavata* (Menzies, 1791)**

Host: *Gymnosarda alletterata* (Raf.)

Location: Stomach

Locality: Hood Island, Charles Island, Galapagos

Number: 2 from one host, one from another

Identification of this species was made on the size and shape of the body, on the separate sex openings on the genital papilla, and on egg size (31 by 23 μ). Specific identification is difficult in this group. While *G. alletterata* is apparently a new host, this trematode is known from a number of related fishes.

Hirudinella beebei Chandler, 1937

Host: *Acanthocybium solandri* (Cuv. and Val.)

Location: Stomach

Locality: Galapagos Islands

Number: Several collected; usually one to 3 present in a host

These giant trematodes, probably the largest species known, have been reported from the wahoo (*Acanthocybium petus*) by Chandler (1937) and from *A. solandri* from Bermuda and Yucatan by Nigrelli and Stunkard (1937). The author has a specimen collected by Dr. A. O. Foster from *A. solandri* from Panama Bay. The trematode evidently has a wide distribution in both oceans.

Living specimens when extended (stretched) attained a length of 125 mm, when contracted only about 40 mm. My largest preserved specimen is 65 mm, the same length reported by Nigrelli and Stunkard.

Syncoeliidae Dollfus, 1923

Paronatrema mantae, new species

(Plate 50, figs. 129-133)

Host: *Manta birostris* (Walbaum)

Location: External, on the skin

Locality: Bahia Honda, Panama

Number: 4 specimens

This trematode furnishes additional data on the little-known genus *Paronatrema* Dollfus, 1937. From its study, the following generic diagnosis is proposed.

GENERIC DIAGNOSIS OF PARONATREMA

Syncoeliidae. Large-sized distomes with unspined skin; suckers large, forebody narrow, hindbody wide. Acetabulum with a ring of small accessory suckers; a ring of accessory suckers may also occur in oral sucker. Glands in forebody. Intestinal ceca sinuous, probably opening into ex-

cretory vesicle. Genital pore opposite pharynx. Testes tubular, irregularly segmented, in region immediately postacetabular; vasa efferentia swollen; vas deferens coiled, tubular; prostatic cells free; no cirrus or cirrus sac; genital atrium large. Ovary globular (or follicular?), posttesticular; uterus very well developed, extending to near posterior end of body, in many narrow transverse coils filling most of hindbody and covering all organs, only slightly coiled in forebody; uterine seminal receptacle present; vitellaria tubular or more or less segmented into elongate follicles, anterior and posterior to ovary. Eggs small, thick shelled. Excretory vesicle short; lateral collecting tubes bend posteriorly to posterior end of body, then extend coiling to extreme anterior end, forming a ring (with branches) around the anterior edge of oral sucker. Type species: *P. vaginicola* Dollfus, 1937.

SPECIFIC DIAGNOSIS OF PARONATREMA MANTAE

Length 17.5 to 19.8; greatest width (just posterior to acetabulum) 4.18 to 4.61. Forebody 6.68 to 7; hindbody 6.3 to 8.4. Oral sucker 1.809 to 1.971 in transverse diameter, with an internal ring of 41 to 47 accessory suckers. Acetabulum 3.064 to 3.591 in transverse diameter; sucker ratio approximately 1:2. Acetabulum with a ring of 29 to 37 accessory suckers. Pharynx 1.147 to 1.215 long by 0.634 to 0.815 wide. Esophagus lacking or very short; ceca bending anteriorly to midpharynx level where small cecal pouches (the "Drusenmagen" of Buttell-Reepen, Muhlschlag, and Odhner) occur; ceca sinuous. Genital pore submedian, opposite anterior edge of pharynx. Testes irregularly tubular, more or less segmented, from posterior edge of acetabulum halfway to ovary; seminal vesicle sinuous from atrium to midacetabulum; prostatic gland from base of atrium to slightly posterior to pharynx. Ovary median, smooth, globular; shell gland at posterior edge of ovary; vitellaria irregularly tubular, fragmented, from posterior edge of testes to near posterior end of body, becoming segmented posteriorly; uterus very long with many transverse coils, filling most of body from one side to the other, covering ceca and other organs; eggs with very thin shells until near the acetabulum, then with very thick shells, 24 to 25.5 by 19 to 22 μ ; metraterm projecting into atrium; atrium ovoid, thick walled, with external muscles. Excretory pore terminal, vesicle short and wide; lateral tubules directed backward to posterior end (fig. 132), then (in sinuous curves and with branches) forward to extreme anterior end where they are connected by a sinuous branched ring around the anterior end of oral sucker.

The name *mantae* is for the generic name of the host.

Comparisons. This species differs from *P. vaginicola* in possessing accessory suckers in the oral sucker, in anterior extent of vasa efferentia, in more anterior genital pore, in shape of the genital atrium, in posterior extent of the testes, and, if Dollfus' identification of the ovary is correct, in the shape of the ovary.

Discussion. The genus *Paronatrema* was named by Dollfus in 1937 from two immature specimens from the oviduct of *Squalus* (?) sp. from New Guinea. Dollfus named the genus and the species (*P. vaginicola*) tentatively because of the scarcity and immaturity of the material. He noted relationships to the genus *Otiotrema*. The writer agrees with such indicated relationship and includes *Paronatrema* in the family Syncoeliidae.

The location of the trematodes on the surface of the ray (a large selachian approximately 14 feet in diameter) is unusual for a distome. The sex of the host was not recorded, and the reproductive ducts were not examined. It is quite possible that the specimens collected had migrated from the oviducts.

The peculiar accessory suckers arranged in a ring around the periphery of the acetabulum were noted by Dollfus. In *P. mantae* their numbers in 3 specimens are 29, 34, and 37, respectively. Each accessory sucker (fig. 131) is a subspherical body (muscular) with the free end cup shaped. Each is attached at the angles formed by a scalloping of the muscular border of the acetabulum.

A similar ring of small accessory suckers occurs just within the mouth cavity near the edge of the oral aperture. The anterior edge of the body surmounting the oral sucker is irregularly scalloped or indented, but the ring of suckers is internal just within the oral cavity. The number of these suckers is 41, 45, and 47 in 3 specimens. As compared with the acetabular suckers they are smaller, more numerous, and of different shape. They are flat, cuplike, pedunculated structures (fig. 130). They were not described for *P. vaginicola*.

The tips of the ceca come in very close association with the excretory vesicle. Dollfus suspected the ceca connected with the vesicle, and all my specimens suggest the same thing. Not even good frontal sections, however, conclusively show such a connection. The tip of each cecum becomes very thin at a spot in contact with the vesicle, and there is probably a fine connection.

The excretory system is peculiar in the backward direction of the collecting tubes which then coil forward, giving off some branches. The peculiar circumferential ring around the anterior edge of the oral sucker is clearly evident as are the short coiled, blunt branches it gives off.

The uterus is remarkably developed and obscures almost all other organs. It is surprising to find such a small ovary producing so many thousands of eggs.

Aporocotylidae Odhner, 1912

Psettarium tropicum, new species

(Plate 50, figs. 134-136)

Host: *Cheilichthys annulatus* (Jenyns)

Location: Recovered from washings of the coelom and once from the intestine. Probably originally in the blood vessels

Locality: San Francisco, Ecuador

Number: 3 specimens, 2 incomplete, from a single host

SPECIFIC DIAGNOSIS OF PSETTARIUM TROPICUM

Body flat, thin, elongate, spined, 3.483 in length by 0.412 in greatest width, tapering slightly toward each end, almost equally wide along most of body length. Spines along edge and extending inward dorsally or ventrally a short distance; near anterior end spines in short transverse rows, lateral and partly dorsal, each row containing about 12 small pointed spines which tend to fuse at edge of body to form a narrow blade. Posteriorly, the rows of spines become single bladelike spines. Not far from posterior end, the rows may extend onto ventral surface and again be composed of small, separated spines as in anterior region. Right unilateral lobe about 0.3 long at posterior end of body. Suckers lacking. Mouth terminal; esophagus 0.877 long or about $\frac{1}{4}$ body length, slightly sinuous; glandular cells around base of esophagus; anterior ceca about 0.112 long; posterior ceca about 1.728 long; about 0.9 or slightly over $\frac{1}{4}$ body length is posterior to intestinal ceca.

Testes diffuse, indistinct, with boundaries too indefinite to allow counting; small, irregular mass of testicular tissue (almost indistinguishable from vitellaria) in median, intercecal region of body. (Such indistinct testes seem to occur in related forms such as *Psettarium japonicum*.) Vas deferens slightly sinuous, becoming opposite posterior indentation of body a simple elongate seminal vesicle (fig. 135); cirrus sac weakly

developed, thin walled, nonmuscular, 0.076 by 0.019, containing very few prostatic cells. Male pore dorsal, to the right, a little posterior to lateral lobe of body. Ovary median, consisting of 2 fan-shaped lobes, a short distance anterior to lateral indentation of body; more or less porous and meshlike (as in some cestodes). Oviduct straight, extending directly backward to a level opposite male pore where it is joined by the single yolk duct; middle region of oviduct swollen to form a seminal receptacle (fig. 135). After union with vitelline duct the oviduct turns forward and enlarges to form the oötype. Mehlis' gland not clearly delimited but perhaps represented by glandular cells filling much of posterior end of body. Uterus postovarian with broad ascending limb and smaller descending coils. Uterine pore ventral, to the right, anterior to lateral indentation, postovarian. Eggs fairly numerous, very thin shelled, broadly ovoid, 29 to 32 by 18 to 20 μ . Vitellaria of small spherical masses chiefly between ovary and intestinal bifurcation; a few follicles extending along each side of esophagus as far as the nerve commissure; not extending posterior to ovary. Excretory pore terminal; excretory vesicle not traced.

The name *tropicum* is for the region where the parasite was collected.

Discussion. *P. tropicum* differs from *P. japonicum* (Goto and Ozaki, 1929), the only other species in the genus, in its longer esophagus, less extensive vitellaria, more slender body, bilobed ovary, weaker cirrus sac of different shape, and larger seminal vesicle. The bilobed ovary of *P. tropicum* suggests the genus *Sanguinicola* but the genital pores are post-ovarian. *P. japonicum* is from a related host as is also another related species *Paradeontacylix odhneri* (Layman, 1930) McIntosh, 1934.

The genus *Psettarium* was named by Goto and Ozaki in 1930 for the genus *Plehnia* Goto and Ozaki, 1929, the name of which was pre-occupied. Its type species thus became *Psettarium japonicum* (Goto and Ozaki, 1929). McIntosh (1934) described the genus *Paradeontacylix* for a species of blood fluke (*P. sanguinicola*) from *Seriola lalandi*. He also transferred *Aporocotyle odhneri* Layman, 1930 to *Paradeontacylix*. Although *Paradeontacylix* was not compared with *Psettarium*, McIntosh in correspondence with the writer considers the reticular structure of the testis in *Psettarium* a generic character separating the two genera.

The family Aporocotylidae contains the following genera: *Aporocotyle* Odhner, 1910; *Sanguinicola* Plehn, 1905 (synonym, as indicated by McIntosh, Janickia Rášin, 1929); *Deontacylix* Linton, 1910; *Psettarium* Goto and Ozaki, 1930; and *Paradeontacylix* McIntosh, 1934.

It is not certain that members of the Aporocotylidae are limited to the blood of their hosts. *P. tropicum* was collected from washings of the coelom and apparently once from the intestine. Since the host had been dissected, the small flukes might easily have been in the blood vessels. But the writer has collected numbers of *Deontacylix ovalis* Linton from the coelom of the host even when the fish had been carefully opened.

HOST LIST

This list contains only those species of fishes from which trematodes were collected. The number in parentheses following the name of the host indicates the number examined. The number following the name of the parasite indicates the number of host specimens from which the parasite was collected. An asterisk (*) following the name of the host indicates that the fish was identified by G. S. Myers or E. D. Reid of the United States National Museum.

Trematodes without author names are species named in this paper.

For possible convenience, the common names of the fishes usually are given.

<i>Abudefduf saxatilis</i> ,* sergeant-major	(8)
<i>Opegaster acuta</i> (in 5)	
<i>Theletrum gravidum</i> (in 4)	
<i>Acanthocybium solandri</i> , wahoo	(2)
<i>Gotocotyla acanthocybii</i> Meserve (in 1)	
<i>Hirudinella beebei</i> Chandler (in 2)	
<i>Anchovia arenicola</i> ,* anchovy	(15)
<i>Parahemiurus ecuadori</i> (in 1)	
<i>P. merus</i> (Linton) (in 2)	
<i>Angelichthys</i> sp., angelfish	(1)
<i>Opechona orientalis</i> (Layman) (in 1)	
<i>Tetrochetus proctocolus</i> (in 1)	
Angelfish (unidentified)	(4)
<i>Theletrum lissosomum</i> (in 2)	
<i>Anisotremus interruptus</i> ,* grunt	(4)
<i>Hamacreadium oscitans</i> Linton (in 1)	
<i>Leurodera pacifica</i> (in 3)	
<i>Proctotrema longicaecum</i> (in 1)	

<i>Anisotremus scapularis</i> ,* grunt	(2)
<i>Leurodera pacifica</i> (in 1)	
<i>Podocotyle breviformis</i> (in 2)	
<i>Stephanostomum anisotremi</i> (in 2)	
<i>Balistes polylepis</i> , triggerfish	(2)
<i>Pseudocreadium scaphosomum</i> (in 2)	
<i>Balistes verres</i> , triggerfish	(6)
<i>Opegaster pentedactyla</i> (in 2)	
<i>Pseudocreadium scaphosomum</i> (in 2)	
<i>Pseudolepidapedon balistis</i> (in 1)	
<i>Bathygobius soporator</i> ,* goby	(4)
<i>Coitocaecum tropicum</i> (in 2)	
Blenny, unidentified	(9)
<i>Coitocaecum tropicum</i> (in 2)	
<i>Bodianus diplotaenia</i>	(8)
<i>Lepocreadium bimarinum</i> (in 3)	
<i>Calamus brachysomus</i> , porgy	(6)
<i>Lecithochirium microstomum</i> Chandler (in 2)	
<i>Plagioporus gastrocotylus</i> (in 3)	
<i>Caranx caballus</i> , jack	(2)
<i>Tergestia laticollis</i> (Rud.) (in 1)	
<i>Caranx hippos</i> , jack; cavalla	(7)
<i>Bucephalus introversus</i> (in 1)	
<i>Dihemistephanus brachyderus</i> (in 1)	
<i>Stephanostomum megacephalum</i> (in 3)	
<i>S. longisomum</i> (in 2)	
<i>Caranx lugubris</i> , jack	(7)
<i>Elytrophallus mexicanus</i> (in 2)	
<i>Caranx melampygus</i> , jack	(8)
<i>Axine elongata</i> Meserve (in 1)	
<i>Caulolatilus anomalus</i> , whitefish	(4)
<i>Choanodera caulolatlili</i> (in 4)	
<i>Proctoeces magnorus</i> (in 1)	
<i>Caulolatilus</i> sp., whitefish	(6)
<i>Choanodera caulolatlili</i> (in 1)	
<i>Diclidophora caulolatlili</i> Meserve (in 2)	
<i>Encotyllabe pagrosomi</i> MacCallum (in 1)	

- Lecithochirium microstomum* Chandler (in 1)
Myzotus vitellus (in 2)
Pseudocreadium spinosum (in 1)
Cheilichthys annulatus, puffer (16)
Apocreadium longisinosum Manter (in 1)
Bianium adplicatum (in 5)
Heterobothrium ecuadori Meserve (in 3)
Psettarium tropicum (in 1)
Tetrochetus proctocolus (in 3)
Coryphaena hippurus, dolphin (1)
Dinurus barbatus (Cohn) (in 1)
D. longisinus Looss (in 1)
*Cratinus agassizii** (5)
Derogenes varicus (Müller) (in 1)
Entobdella muelleri Meserve (in 1)
Cypselurus californicus, flying fish (10)
Cestracolpa yamagutii Meserve (in 1)
Cypselurus callopterus, flying fish (12)
Cestracolpa cypseluri Meserve (in 1)
Elagatis bipinnulatus, runner (1)
Gotocotyla elagatis Meserve (in 1)
Stephanostomum hispidum (Yamaguti) (in 1)
Epinephelus labriformis, grouper (6)
Elytrophallus mexicanus (in 1)
Helicometra torta Linton (in 1)
Epinephelus sp. (?), grouper (7)
Elytrophallus mexicanus (in 2)
Lecithochirium magnaporum (in 1)
Eucinostomus californiensis (11)
Anisoporus eucinostomi (in 1)
 Flounder, unidentified (10)
Derogenes sp. (in 1)
Helicometra fasciata (Rud.) (in 1)
 Flying fish, unidentified (7)
Cestracolpa yamagutii Meserve (in 1)
 Goby, unidentified (2)
Parvacreadium bifidum (in 1)

Groupers, unidentified	(7)
<i>Benedenia adenea</i> Meserve (in 2)	
<i>B. anadenea</i> Meserve (in 2)	
<i>B. isabellae</i> Meserve (in 2)	
<i>Elytrophallus mexicanus</i> (in 1)	
<i>Lepidapedon hancocki</i> (in 1)	
<i>L. nicolli</i> Manter (in 1)	
<i>Podocotyle mecopera</i> (in 1)	
<i>Prosorhynchus gonoderus</i> (in 2)	
<i>P. ozakii</i> Manter (in 1)	
<i>P. pacificus</i> (in 1)	
<i>Stephanostomum multispinosum</i> (in 2)	
<i>Gymnosarda alletterata</i> , bonito	(8)
Didymozoonidae (common)	
<i>Hirudinella clavata</i> (Menzies) (in 4)	
<i>Octocotyle euthynni</i> Meserve (in 1)	
<i>Gymnosarda pelamis</i> , bonito	(4)
Didymozoonidae (in 4)	
<i>Gymnothorax</i> sp., moray	(1)
<i>Prosorhynchus aculeatus</i> Odhner (in 1)	
<i>Halichoeres dispilus</i> ,* slippery dick	(1)
<i>Coitocaecum tropicum</i> (in 1)	
Jack, unidentified	(1)
<i>Bucephalus varicus</i> (in 1)	
<i>Kyphosus elegans</i>	(7)
<i>Haploplanchnus acutus</i> (Linton) (in 1)	
<i>Labrisomus xanti</i> *	(1)
<i>Apocreadium mexicanum</i> Manter (in 1)	
<i>Lutianus jordani</i> , snapper	(3)
<i>Paracryptogonimus americanus</i> (in 1)	
<i>Stephanostomum casum</i> (Linton) (in 1)	
<i>Lutianus novemfasciatus</i> (?), snapper	(1)
<i>Paracryptogonimus americanus</i> (in 1)	
<i>Stephanostomum casum</i> (Linton) (in 1)	
<i>Lutianus viridis</i> (?), snapper	(10)
<i>Elytrophallus mexicanus</i> (in 5)	
<i>Hamacreadium mutabile</i> Linton (in 1)	
<i>Opecoelus mexicanus</i> (in 3)	
<i>Stephanostomum casum</i> (Linton) (in 1)	

Mackerel, unidentified	(4)
<i>Lecithochirium magnaporum</i> (in 1)	
<i>Octocotyle macracantha</i> Meserve (in 1)	
<i>Opechona orientalis</i> Layman (in 2)	
<i>Malacotenus zonifer</i> *	(1)
<i>Coitocaecum tropicum</i> (in 1)	
<i>Manta birostris</i> , blanket fish	(2)
<i>Paronatrema mantae</i> (in 1)	
<i>Medialuna</i> sp. (?), halfmoon	(1)
<i>Proctotrema costaricae</i> (in 1)	
Moray, unidentified	(4)
<i>Helicometra sinuata</i> (Rud.) (in 1)	
<i>Muraena clepsydra</i> , moray	(2)
<i>Sterrhurus fusiformis</i> (Lühe) (in 2)	
<i>Mycteroperca olfax</i> , yellow grouper	(2)
<i>Lepidapedon hancocki</i> (in 2)	
<i>Prosorhynchus ozakii</i> Manter (in 1)	
<i>P. pacificus</i> (in 1)	
<i>Stephanostomum multispinosum</i> (in 1)	
<i>Mycteroperca xenarcha</i> (?), grouper	(8)
<i>Hamacreadium mutabile</i> Linton (in 2)	
<i>Lepidapedon hancocki</i> (in 4)	
<i>Prosorhynchus ozakii</i> Manter (in 1)	
<i>P. pacificus</i> (in 2)	
<i>Oligoplites saurus</i> , runner	(3)
<i>Axine oligoplitis</i> Meserve (in 1)	
<i>Dihemistephanus brachyderus</i> (in 2)	
<i>Mecoderus oligoplitis</i> (in 2)	
<i>Opisthognathus scopis</i> *, jawfish	(1)
<i>Coitocaecum tropicum</i> (in 1)	
<i>Opisthonema libertate</i> *	(7)
<i>Parahemiurus merus</i> (Linton) (in 1)	
<i>Orthostoechus maculicauda</i>	(1)
<i>Siphoderoides vancleavei</i> (in 1)	
<i>Paralabrax humeralis</i> *, sea bass	(14)
<i>Derogenes varicus</i> (Müller) (in 1)	
<i>Lecithochirium magnaporum</i> (in 2)	
<i>L. microstomum</i> Chandler (in 6)	

- Paralabrax nebulifer*, kelp bass (3)
Helicometrina nimia Linton (in 2)
Opecoelus inimici Yamaguti (in 1)
- Paralabrax* sp. (?) (3)
Opecoelina pacifica (in 1)
- Paranthias furcifer*,* sea bass (16)
Elytrophallus mexicanus (in 4)
Heterobothrium galapagoensis Meserve (in 1)
Lecithochirium microstomum Chandler (in 6)
Opechona orientalis (Layman) (in 1)
Opecoelus mexicanus (in 3)
- Pimelometopon pulcher*,* fathead (1)
Labrifer secundus (in 1)
Lepocreadium bimarinum (in 1)
- Polynemus approximans*,* threadfin (1)
Anisoporus eucinostomi (in 1)
- Pomacentrus rectifraenum* (4)
Haplospilichthys pomacentri Manter (in 3)
- Priacanthus* sp. (?) (1)
Microcotyle priacanthi Meserve (in 1)
- Rypticus safronaceus bicolor** (1)
Prosorhynchus rotundus (in 1)
- Scomberomorus maculatus*, Spanish mackerel (8)
Thoracocotyle paradoxa Meserve (in 1)
- Selar crumenophthalmus*,* goggle-eye (4)
Cymbephallus carangi Yamaguti (in 4)
- Seriola dorsalis* (10)
Axine seriolae Meserve (in 1)
Bucephalus introversus (in 2)
Lecithochirium magnaporum (in 1)
Stephanostomum hispidum (Yamaguti) (in 2)
- Seriola dumerili* (?), amber jack (1)
Bucephalus introversus (in 1)
Stephanostomum hispidum (Yamaguti) (in 1)
- Seriola* sp. (1)
Bucephalus introversus (in 1)
- Silvery, small, tide-pool fish (10)
Dactylostomum vitellosum (in 1)

<i>Spheroides angusticeps</i> , puffer	(2)
<i>Apocreadium longisinosum</i> Manter (in 2)	
<i>Bianium adplicatum</i> (in 1)	
Stargazer, unidentified	(4)
<i>Helicometra fasciata</i> (Rud.) (in 1)	
<i>Symphurus atramentatus</i> ,* tonguefish	(3)
<i>Paramonorchoides bivitellosus</i> (in 2)	
<i>Thyrinops pachylepis</i> ,* silversides	(10)
<i>Anisoporus thyrinopsi</i> (in 1)	
<i>Trachinotus paloma</i> , pompano	(1)
<i>Lobatostoma pacificum</i> (in 1)	
<i>Trachinotus rhodopus</i> , pompano	(5)
<i>Aponurus trachinoti</i> (in 1)	
<i>Gonocercella pacifica</i> (in 1)	
<i>Opechona pharyngodactyla</i> (in 3)	
<i>Opegaster parapristipomatis</i> Yamaguti (in 2)	
<i>Tetrochetus proctocolus</i> (in 1)	
<i>Tylosurus fodiator</i> , needlefish	(7)
<i>Axine abberans</i> Goto (in 1)	
<i>Haplospilachna acutus</i> (Linton) (in 1)	
<i>Xenistius californiensis</i>	(6)
<i>Opecoelus xenistii</i> (in 1)	
<i>Xurel marginatus</i> , jack	(3)
<i>Protomicrocotyle pacifica</i> Meserve (in 2)	
<i>Zalocys stilbe</i> , pompano	(1)
<i>Elytrophallus mexicanus</i> (in 1)	
<i>Opechona pharyngodactyla</i> (in 1)	

SUMMARY AND CONCLUSIONS

Eighty-two species of digenetic trematodes are reported from 80 different species of marine fishes of the tropical American Pacific. Fifty-three new species and 7 new genera are named. The number of new genera compared with the number of new species is rather small considering the new locality. For example, among 33 new species from deep-water fishes at Tortugas listed by Manter (1934) there were 11 new genera. This rather small number of new genera in the tropical Pacific may possibly suggest that the number of unnamed genera in this group

of animals is now materially reduced, or that the trematodes of these regions are chiefly derived from (or ancestral to) relatives not yet generically differentiated.

In addition to new species and genera, the following taxonomic changes are proposed in this paper: (1) *Prosorhynchus caudovatus*, n. nom. is proposed for the *P. crucibulus* of Eckmann, 1932. (2) *Dollfustrema* Eckmann, 1932 is considered a synonym of *Mordvilkovia* Pigulewsky, 1931. (3) *Pseudoprosorhynchus* Yamaguti, 1938 is considered a synonym of *Neidhartia* Nagaty, 1937. (4) *Bucephalus varicus*, n. nom. is proposed for the *B. polymorphus* of Nagaty, 1937. (5) *Bucephalus kathetostomae* (Manter), n. comb. is proposed for *Rhipidocotyle kathetostomae* Manter, 1934. (6) *Hypocreadium* Ozaki, 1936 is considered a synonym of *Pseudocreadium* Layman, 1930 and *P. patellare* (Yamaguti, 1938) is a n. comb. (7) *Proctotrema truncata* (Linton), n. comb. is proposed for *Genolopa truncata* Linton, 1910. (8) *Theledera* Linton, 1910 and *Cithara* MacCallum, 1917 are considered synonyms of *Tergestia* Stoss., thus resulting in *Tergestia pectinata* (Linton), n. comb. and *T. priacanthi* (MacCallum), n. comb. (9) *Parahemiurus parahemiurus* Vaz and Pereira, 1930, *P. platichthys* Lloyd, 1939; *P. atherinae* Yamaguti, 1938, *P. harengulae* Yamaguti, 1938 all are considered to be synonyms of *P. merus* (Linton, 1910). (10) *Gonocercella atlantica*, new species is named for "Dist. sp." of Linton, 1905, p. 367, fig. 204. (11) *Siphoderinae* Manter, 1934, *Neochasminae* Van Cleave and Mueller, 1932, and *Exorchiinae* Yamaguti, 1938 all are considered synonyms of *Heterophyinae* Ciurea, 1924.

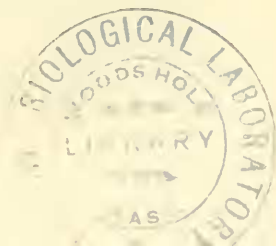
Twenty-three species (more than 25 per cent of the total number collected) are known from the American Atlantic. These 23 species are: *Bucephalus varicus*, *Derogenes varicus*, *Dinurus barbatus*, *D. longisinus*, *Hamacreadium mutabile*, *H. oscitans*, *Haploplanchnus acutus*, *H. pomacentri*, *Helicometra fasciata*, *H. torta*, *Helicometrina nimia*, *Hirudinella beebei*, *H. clavata*, *Lecithochirium microstomum*, *Lepidapedon nicolli*, *Lepocreadium bimarinum*, *Parahemiurus merus*, *Proctotrema longicaecum*, *Prosorhynchus ozakii*, *Stephanostomum casum*, *S. megacephalum*, *Sterrhurus fusiformis*, *Tergestia laticollis*. Six species have been previously reported from Japanese or Siberian seas. These are: *Cymbephallus carangi*, *Opechona inimici*, *O. orientalis*, *Opegaster parapristipomatis*, *Prosorhynchus aculeatus*, *Stephanostomum hispidum*. A single species, *Helicometra sinuata*, is known elsewhere (to date) only from European waters.

Of 10 species of digenetic trematodes collected at Socorro or Clarion Island (Revillagigedo Islands), Mexico, 6 occurred also in the Galapagos Islands. Thus, the writer's preliminary observation (Manter, 1934a), that the trematodes of these two localities were essentially different, is not correct. However, species occurring in both localities may be much more common in one, and fishes found in both localities may show a different infection percentage in one region as compared with the other.

Thirteen species seem to be restricted to the American Atlantic and American Pacific (i.e., they are endemic amphi-American). In each case the hosts are different but related, and in each case the trematode genus is a common, very widely distributed genus.

The digenetic trematode fauna of the tropical American Pacific reveals a very distinct similarity to the trematode fauna of the tropical Atlantic. Otherwise, except for some similarity to that of the Japanese waters, it is distinctly different from known trematode faunas in other parts of the world.

This aspect of the subject will be considered in a later paper.



LITERATURE CITED

BHALERAO, G. D.

1937. Studies on the helminths of India. Trematoda IV. Jour. Helminth., 15:97-124.

BYCHOWSKY, I., and BYCHOWSKY, B.

1934. Über die Morphologie und die Systematik des *Aspidogaster limacoides* Diesing. Zeit. Parasit., 7:125-137, 4 figs.

CHANDLER, ASA C.

1935. Parasites of fishes in Galveston Bay. Proc. U. S. Nat. Mus., 83:123-157.
1937. A new trematode, *Hirudinella beebei*, from the stomach of a Bermuda fish, *Acanthocybium petus*. Trans. Amer. Micros. Soc., 56: 348-354.

CUCKLER, ASHTON C.

1938. Nematode parasites of the Galapagos land iguana. Allan Hancock Pac. Exp., 2(9):137-164.

DOLLFUS, ROBERT PH.

1935. Sur quelques parasites de poissons récoltés à Castiglione (Algérie). Bull. Trav. Sta. Aquicul. Pêché de Castiglione. 2 (1933):199-279.
1937. Les trématodes digenea des Selaciens (Plagiostomes) Catalogue par hôtes. Distribution géographique. Ann. Parasit., 15:259-281.

ECKMANN, F.

1932. Beiträge zur Kenntnis des Trematodenfamilie Bucephalidae. Zeit. Parasit., 5:94-111.

GILBERT, PAUL T.

1938. Three new trematodes from the Galapagos marine iguana *Amblyrhynchus cristatus*. Allan Hancock Pac. Exp., 2(6):91-106.

HICKMAN, V. V.

1934. On *Coitocaecum anaspidis* sp. nov., a trematode exhibiting progenesis in the freshwater crustacean *Anaspides tasmaniae* Thomson. Parasit., 26:121-128.

KOBAYASHI, HARUJIRO

1921. On some digenetic trematodes in Japan. Parasit., 12:380-410.

LAYMAN, E. M.

1930. Parasitic worms from the fishes of Peter the Great Bay. Bull. of Pac. Sci. Fish. Res. Sta., 3(6):1-120.

LINTON, EDWIN

1905. Parasites of fishes of Beaufort, North Carolina. Bull. Bur. Fish., 1904, 24:321-428.
1910. Helminth fauna of the Dry Tortugas. II. Trematodes. Carnegie Inst. Wash. Pub. 133, pp. 11-98.
1934. A new genus of trematodes belonging to the subfamily Allocreadiinae. Jour. Wash. Acad. Sci., 24:81-83.

LITTLE, PERCY A.

1930. A new trematode parasite of *Acipenser sturio* L. (royal sturgeon), with a description of the genus *Dihemistephanus* Lss. Parasit., 22:399-413.

LLOYD, LOWELL C.

1938. Some digenetic trematodes from Puget Sound. Jour. Parasit., 24:103-133.

LLOYD, L. C., and GUBERLET, JOHN E.

1932. A new genus and species of Monorchidae. Jour. Parasit., 18:232-239.

LOOSS, A.

1907. Beiträge zur Systematik der Distomen Zool. Jahrb., Syst., 26:63-180.
1912. Über den Bau einiger anscheinend seltner Trematoden-Arten. Zool. Jahrb., Suppl., 15:323-366, 3 pls.

MCCOY, O. R.

1930. Experimental studies on two fish trematodes of the genus *Hamacreadium* (family Allocreadiidae). Jour. Parasit., 17:1-13.

McFARLANE, S. H.

1936. A study of the endoparasitic trematodes from marine fishes of Departure Bay, B. C. Jour. Biol. Bd. Can., 2(4):335-347.

McINTOSH, ALLEN

1934. A new blood trematode *Paradeontacylix sanguinicoloides* n.g., n.sp., from *Seriola lalandi* with a key to the species of the family Aporocotylidae. Parasit., 26:463-467.

MANTER, H. W.

1931. Some digenetic trematodes of marine fishes of Beaufort, North Carolina. Parasit., 23:396-411.
1933. The genus *Helicometra* and related trematodes from Tortugas, Florida. Carnegie Inst. Wash. Pub. 435, pp. 167-182.
1934. Some digenetic trematodes from deep-water fish of Tortugas, Florida. Carnegie Inst. Wash. Pub. 435, pp. 257-345.
1934a. Preliminary observations on trematodes from the Galapagos Islands and neighboring Pacific. Carnegie Inst. Wash. Year Book No. 33, pp. 260-261.
1935. The structure and taxonomic position of *Megasolena estrix* Linton, 1910 (Trematoda) with notes on related trematodes. Parasit., 27(3):431-439.
1936. Some trematodes of cenote fish from Yucatan. Carnegie Inst. Wash. Pub. 457, pp. 33-38.
1937. A new genus of distomes (Trematoda) with lymphatic vessels. Allan Hancock Pac. Exp., 2(3):11-22.
1937a. The status of the trematode genus *Deradena* Linton with a description of six species of *Haplospilanchnus* Looss (Trematoda). Skrjabin Jub. Vol., pp. 381-387.

MESERVE, FRANK G.

1938. Some monogenetic trematodes from the Galapagos Islands and the neighboring Pacific. Allan Hancock Pac. Exp., 2(5):31-38.

MUELLER, J. F., and VAN CLEAVE, H. J.

1932. Parasites of Oneida Lake fishes. Pt. II. Descriptions of new species and some general taxonomic considerations, especially concerning the trematode family Heterophyidae. Roosevelt Wild Life Ann., 3(2):73-154.

NAGATY, H. F.

1937. Trematodes of fishes from the Red Sea. Pt. I. Studies on the family Bucephalidae Poche, 1907. Egypt. Univ., Faculty Med., Pub. 12, pp. 1-172.

NICOLL, WILLIAM

1910. On the entozoa of fishes from the Firth of Clyde. *Parasit.*, 3:322-359.
1914. The trematode parasites of fishes from the English Channel. *Jour. Mar. Biol. Assoc.*, 10 (n.s.):466-505.

NIGRELLI, ROSS F., and STUNKARD, H. W.

1937. Giant trematodes from the Wahoo, *Acanthocybium solandri* (abstract). *Jour. Parasit.*, 23:567.

ODHNER, T.

1905. Die Trematoden des arktischen Gebietes. *Fauna Arctica*, 4(2):291-372.
1911. Zur natürlichen System der digenen Trematoden. III. *Zool. Anz.*, 38:97-117.
1928. Weitere Trematoden mit Anus. *Ark. Zool.*, 20 (B, 2):1-6.

OZAKI, Y.

1928. Some gasterostomatous trematodes of Japan. *Jap. Jour. Zool.*, 2:35-60.
1928a. On some trematodes with anus. *Jap. Jour. Zool.*, 2:5-33.
1934. *Petalocotyle nipponica*, a new type of the trematode family Allocreadiidae. *Proc. Imp. Acad.*, 10(2):111-114.
1937. Studies on the trematode families Gyliachenidae and Opistholebetidae, with special reference to lymph system, I. *Jour. Sci., Hiroshima Univ.*, B, 5(6):125-165.
1937a. Studies on the trematode families Gyliachenidae and Opistholebetidae, with special reference to lymph system, II. *Jour. Sci., Hiroshima Univ.*, B, 5(7):167-244.

PALOMBI, ARTURO

1929. Ricerche sul ciclo evolutivo di *Helicometra fasciata* (Rud.). *Pub. della Stazione Zool. di Napoli*, 9(2):237-292.

PARK, JAMES T.

1936. Two new trematodes, *Sterrhurus magnatestis* and *Tubulovesicula californica* (Hemiuridae) from littoral fishes of Dillon's Beach, California. *Trans. Amer. Micros. Soc.*, 55:477-482.
1937. A new trematode, *Genitocotyle acirrus*, gen.nov., sp.nov. (Allocreadiidae), from *Holoconotus rhodoterus*. *Trans. Amer. Micros. Soc.*, 56:67-71.
1937a. A revision of the genus *Podocotyle* (Allocreadiinae), with a description of eight new species from the tide pool fishes from Dillon's Beach, California. *Jour. Parasit.*, 23:405-422.
1938. A new fish trematode with single testis from Korea. *Keijo Jour. Med.*, 9(4):290-298.

SRIVASTAVA, H. D.

1936. New allocreadids (Trematoda) from marine fishes. Part I. New parasites of the genus *Helicometrina* Linton, 1910. *Proc. Nat. Acad. Sci. India*, 6(2):179-185.

SHEN, T.

1930. Sur un gasterostomide immature chez *Siniperca*. *Ann. Parasit.*, 8:554-561.

STUNKARD, H. W.

1931. Further observations on the occurrence of anal openings in digenetic trematodes. *Zeit. Parasit.*, 3:713-725.

VAN CLEAVE, H. J., and MUELLER, J. F.

1932. Parasites of the Oneida Lake fishes. Part I. Descriptions of new genera and new species. Roosevelt Wild Life Ann., 3(1):2-71.
1934. Parasites of Oneida Lake fishes. Part III. A biological and ecological survey of the worm parasites. Part IV. Additional notes on parasites of Oneida Lake fishes, including descriptions of new species. Roosevelt Wild Life Ann., 3(3&4):156-373.

VAZ, ZEFERINA, and PEREIRA, CLEMENTE

1930. Nouvel hemiuride parasite de *Sardinella aurita* Cuv. et Val., *Parahemiurus*, n.g. C. R. Soc. Biol., 103:1315-1317.

VERMA, S. C.

1936. Studies on the family Bucephalidae (Gasterostomata). Part I—Descriptions of new forms from Indian fresh-water fishes. Proc. Nat. Acad. Sci., India, 6:66-89.

WARD, HENRY B.

1938. On the genus *Deropristis* and the *Acanthocolpidae* (Trematoda). Liv. Jub. Prof. Travassos, pp. 509-521.

WOOLCOCK, VIOLET

1935. Digenetic trematodes from some Australian fishes. Parasit., 27:309-331.

YAMAGUTI, S.

1934. Studies on the helminth fauna of Japan. Part 2. Trematodes of fishes, I. Jap. Jour. Zool. 5:249-541.
1938. Studies on the helminth fauna of Japan. Part 21. Trematodes of fishes, IV. Kyoto, Japan. Pp. 1-139.

EXPLANATION OF PLATES

All figures, except diagrams, were drawn with the aid of a camera lucida. The projected scale has the value indicated in each figure. Abbreviations are as follows:

<i>a</i>	anus	<i>mt</i>	metraterm
<i>ac</i>	anterior cecum	<i>o</i>	egg
<i>act</i>	acetabulum	<i>os</i>	oral sucker
<i>af</i>	anterior fold	<i>ov</i>	ovary
<i>aml</i>	anterior muscular lip	<i>pc</i>	papillated cirrus
<i>ap</i>	acetabular pore	<i>pce</i>	posterior cecum
<i>as</i>	accessory sucker	<i>pg</i>	prostate gland
<i>ce</i>	intestinal cecum	<i>pl</i>	posterior lip
<i>cir</i>	cirrus	<i>pp</i>	pars prostatica
<i>cs</i>	cirrus sac	<i>pph</i>	prepharynx
<i>ed</i>	esophageal diverticulum	<i>pr</i>	prostatic cells
<i>ep</i>	excretory pore	<i>prv</i>	prostatic vesicle
<i>es</i>	esophagus	<i>psp</i>	presomatic pit
<i>esw</i>	external seminal vesicle	<i>rh</i>	rhynchus
<i>ex</i>	excretory vesicle	<i>rvt</i>	rudimentary vitellaria
<i>ga</i>	genital atrium	<i>sr</i>	seminal receptacle
<i>go</i>	gonotyl	<i>ss</i>	sinus sac
<i>gp</i>	genital pore	<i>sv</i>	seminal vesicle
<i>gs</i>	genital sinus	<i>t</i>	testis
<i>gsw</i>	glandular seminal vesicle	<i>ts</i>	thin-walled portion of sinus sac
<i>isv</i>	internal seminal vesicle	<i>up</i>	uterine pore
<i>lv</i>	lymphatic vessel	<i>ut</i>	uterus
<i>m</i>	mouth	<i>utsr</i>	uterine seminal receptacle
<i>mg</i>	Mehlis' gland	<i>vt</i>	vitellaria
<i>mp</i>	male pore	<i>yd</i>	yolk duct
<i>ms</i>	metraterm sac	<i>yr</i>	yolk reservoir

PLATE 32

- FIG. 1. *Lobatostoma pacificum*. Ventral view.
- FIG. 2. *L. pacificum*. Enlarged view of region near the genital pore.
- FIG. 3. *Bucephalus varicus* from *Caranx* species from Panama. Ventral view.
- FIG. 4. *B. varicus* from same host. Tentacle extended. Enlarged.
- FIG. 5. *B. varicus* from *Caranx latus* from Tortugas, Florida. Lateral view of extended specimen.
- FIG. 6. *B. varicus* from same host. Variations in appearance of tentacles.
- FIG. 7. *B. varicus* from same host. Variations in appearance of eggs.
- FIG. 8. *B. varicus* from *Caranx ruber* from Tortugas, Florida. Ventral view.
- FIG. 9. *B. varicus* from same host. Eggs.
- FIG. 10. *Bucephalus introversus* from *Seriola* species from Port Culebra, Colombia. Lateral view.
- FIG. 11. *B. introversus* from *Seriola dorsalis* from Port Utria, Colombia. Ventral view of anterior sucker.
- FIG. 12. *B. introversus* from same host. Tentacle extended.

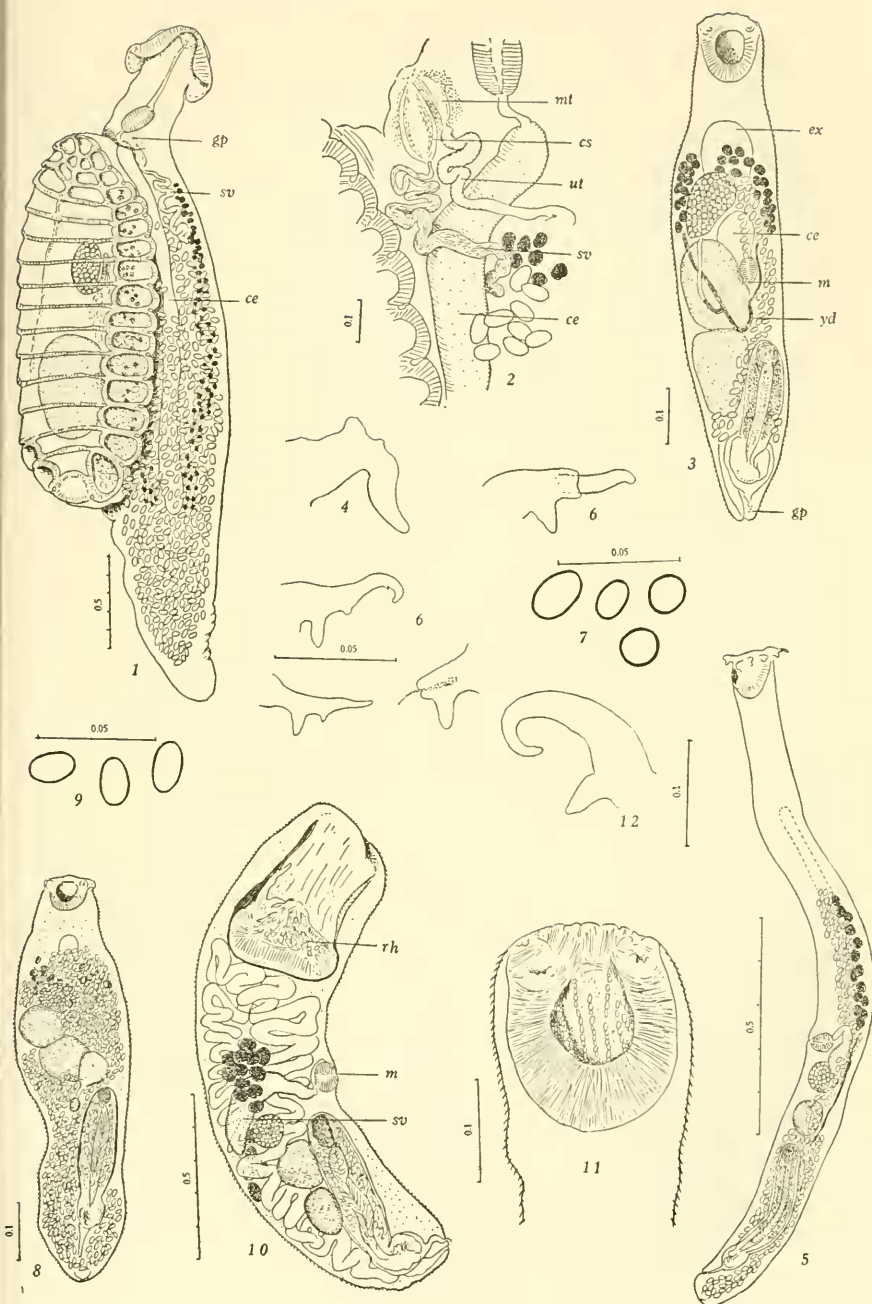


PLATE 33

- FIG. 13. *Prosorhynchus ozakii* from a spotted grouper from Isabel Island, Mexico. Ventral view.
- FIG. 14. *Prosorhynchus aculeatus* from *Gymnothorax* sp. from Charles Island. Ventral view.
- FIG. 15. *Prosorhynchus rotundus* from *Rypticus safronaceus bicolor*, Albemarle Island. Ventral view.
- FIG. 16. *Prosorhynchus gonoderus* from grouper from James Island. Ventral view.
- FIG. 17. *P. pacificus* from *Mycteroperca olfax* from Albemarle Island. Ventral view.
- FIG. 18. *Choanodera caulolatili* from *Caulolatilus anomalus*. Ventral view.

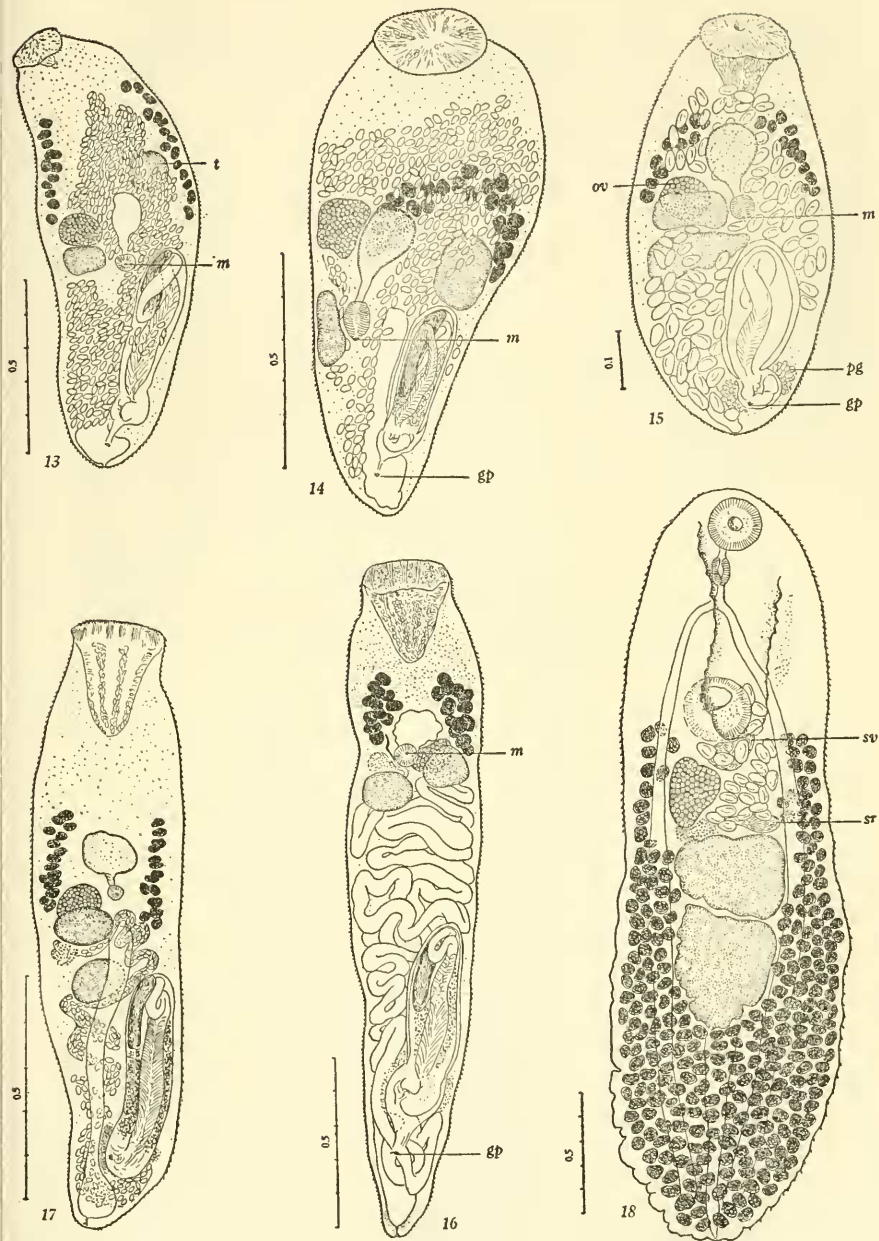


PLATE 34

- FIG. 19. *Lepocreadium bimarinum* from *Pimelometrou pulcher* from Cerros Island, Mexico. Ventral view.
- FIG. 20. *L. bimarinum*. Enlarged, dorsal view of region of the cirrus sac.
- FIG. 21. *L. bimarinum* from *Lachnolaimus maximus* from Tortugas, Florida. Ventral view.
- FIG. 22. *Opechona pharyngodactyla* from *Trachinotus rhodopus*. Ventral view.
- FIG. 23. *O. pharyngodactyla*. Anterior end of pharynx, showing processes.
- FIG. 24. *O. orientalis* from *Angelichthys* sp. Ventral view.
- FIG. 25. *O. orientalis* from *Paranthias furcifer*. Ventral view.

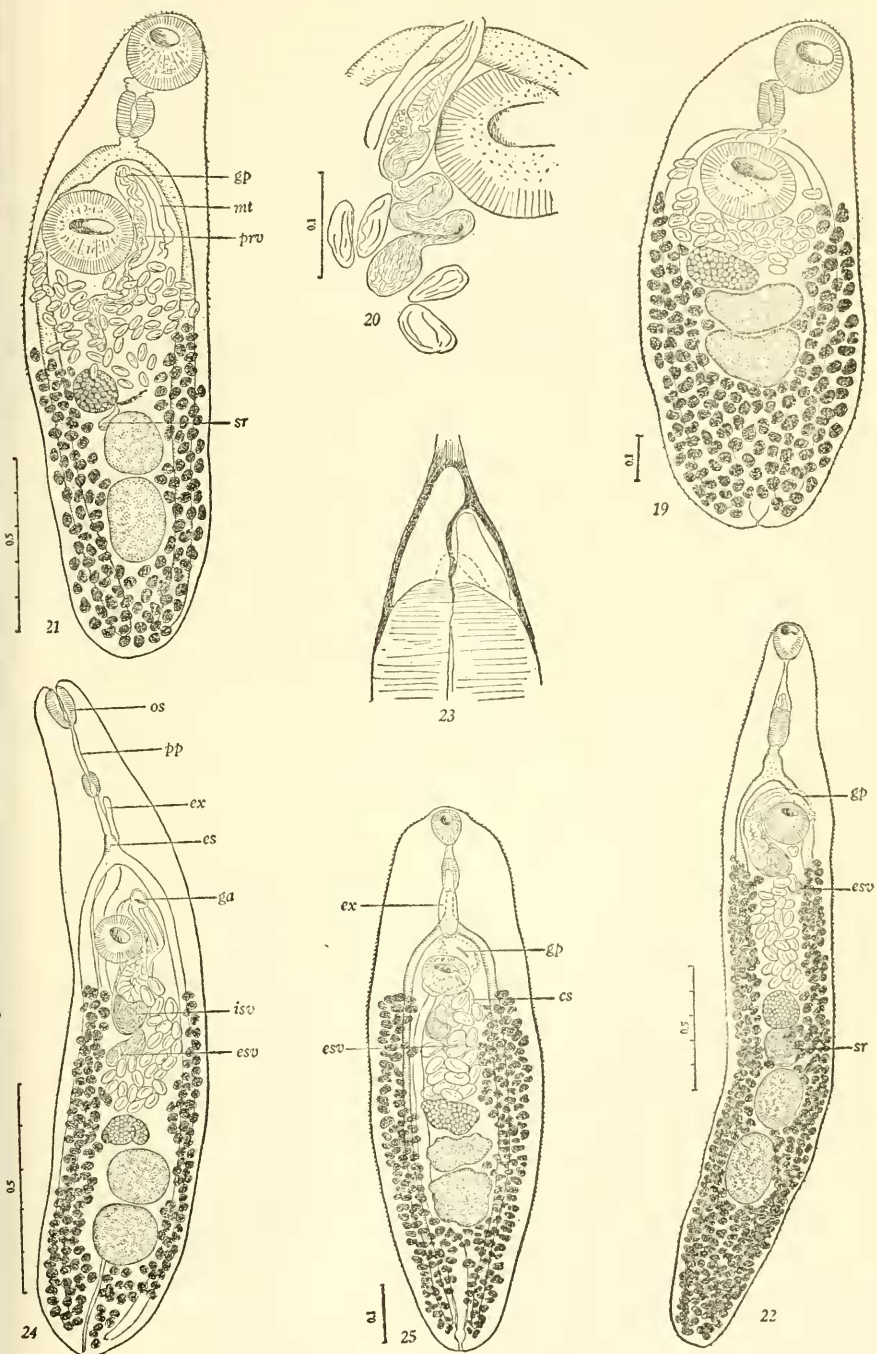


PLATE 35

- FIG. 26. *Lepidapedon hancocki* from *Mycteroperca olfax*. Ventral view.
- FIG. 27. *Pseudolepidapedon balistis* from *Balistes verres*. Ventral view.
- FIG. 28. *Pseudocreadium scaphosomum* from *Balistes polylepis*. Ventral view.
- FIG. 29. *P. scaphosomum*. Enlarged view of terminal genital organs.
- FIG. 30. *P. spinosum* from *Caulolatilus* sp. Ventral view.
- FIG. 31. *P. spinosum*. Enlarged view of cirrus sac.

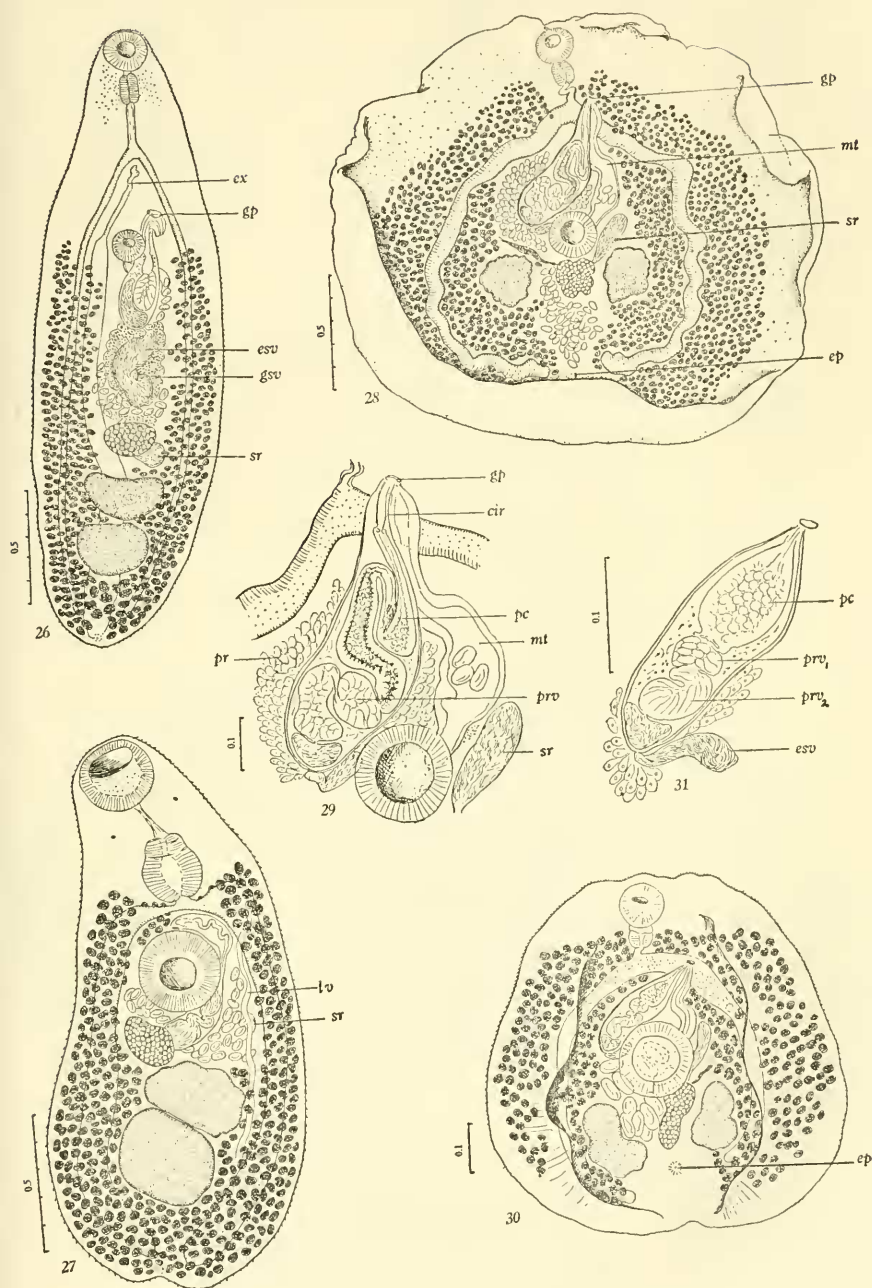


PLATE 36

- FIG. 32. *Anisoporus eucinostomi* from *Eucinostomus californiensis*. Ventral view.
- FIG. 33. *A. eucinostomi* from same host. Enlarged, ventral view of anterior part of body.
- FIG. 34. *Anisoporus thyrinopsi* from *Thyrinops pachylepis*. Ventral view.
- FIG. 35. *Dactylostomum vitellosum* from unidentified, tide-pool fish. Ventrolateral view.
- FIG. 36. *Opecoelus mexicanus* from *Paranthias furcifer*. Ventral view.
- FIG. 37. *O. mexicanus*. Enlarged view of acetabular papillae showing manner of overlapping, like clasped fingers.
- FIG. 38. *Opecoelus xenistii* from *Xenistius californiensis*. Ventral view.

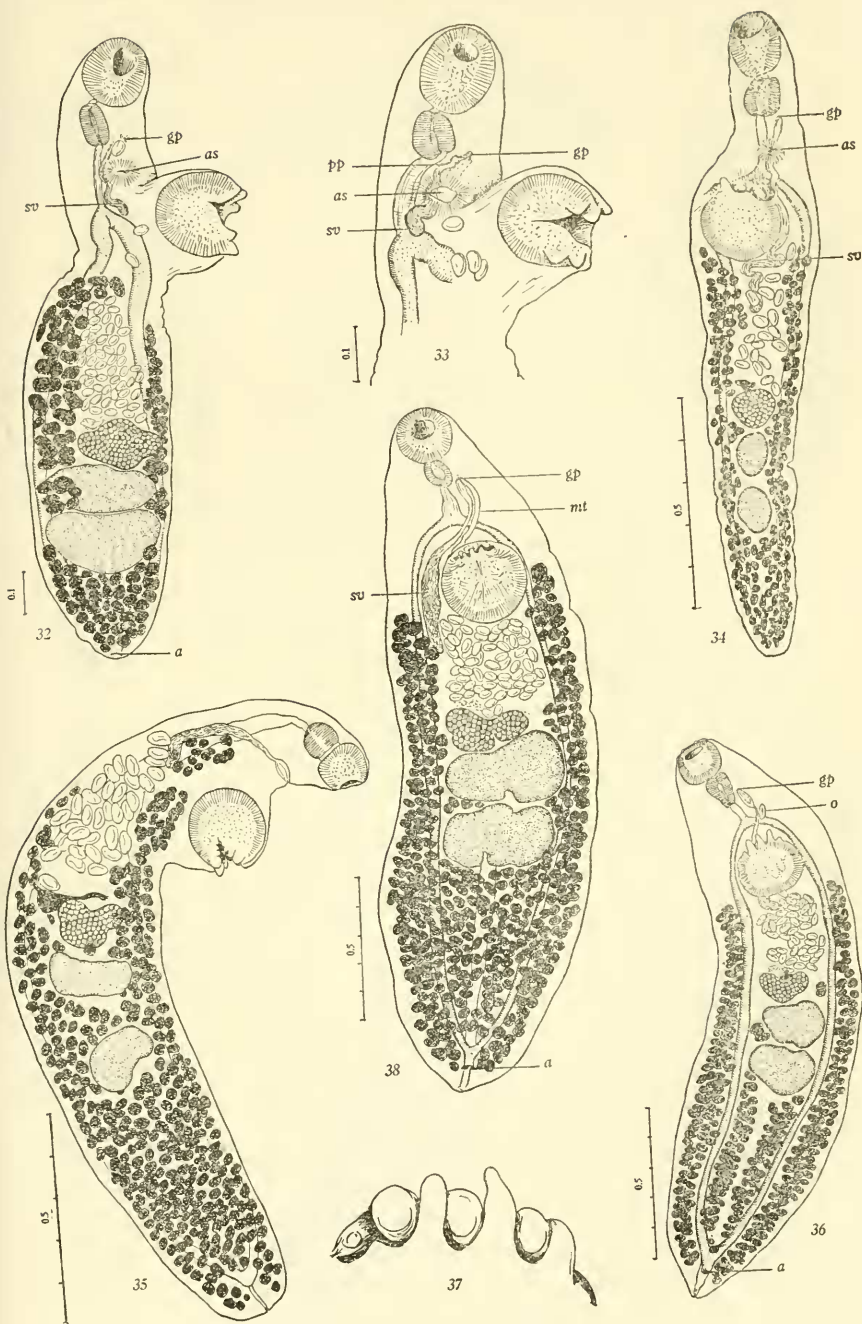


PLATE 37

- FIG. 39. *Opecoelus xenistii*. Enlarged view of acetabular papillae.
- FIG. 40. *Opecoelus inimici* Yamaguti from *Paralabrax nebulifer*. Ventral view.
- FIG. 41. *Opegaster acuta* from *Abudefduf saxatilis*. Ventral view.
- FIG. 42. *Opegaster pentedactyla* from *Balistes verres*. Dorsal view.
- FIG. 43. *Opegaster parapristipomatis* Yamaguti from *Trachinotus rhodopus*. Ventral view.
- FIG. 44. *Coitocaecum tropicum* from *Halichoeres dispilus*. Dorsal view.
- FIG. 45. *C. tropicum*. Enlarged, dorsal view of terminal reproductive organs.

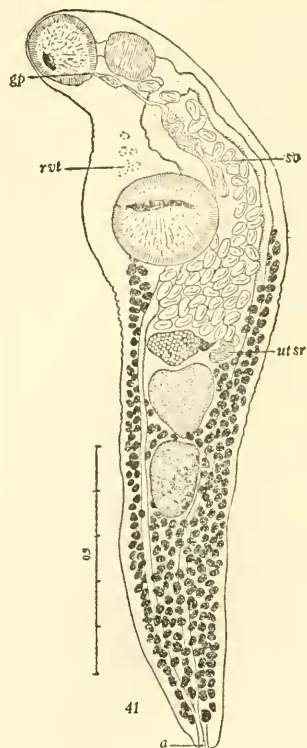
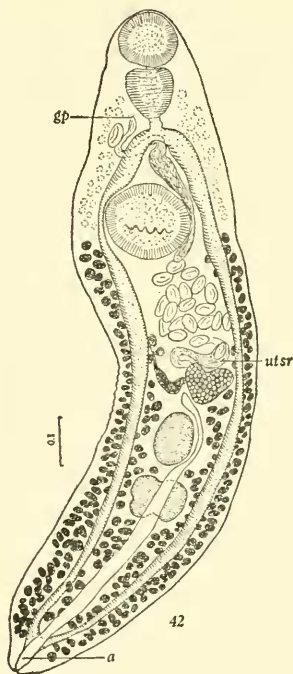
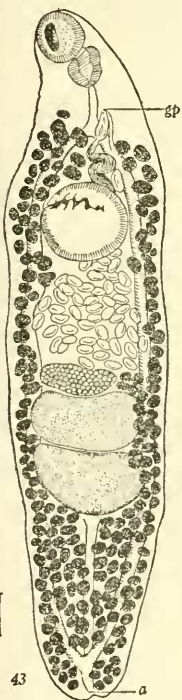
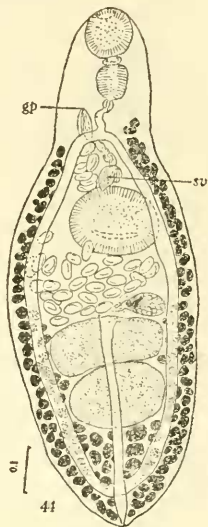
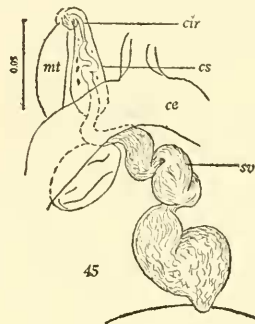
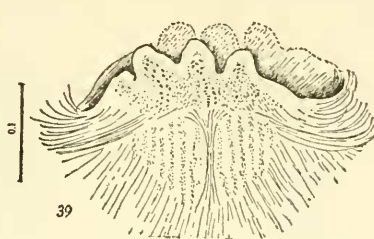
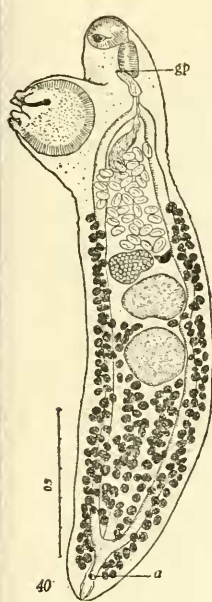


PLATE 38

- FIG. 46. *Opecoelina pacifica* from *Paralabrax* species. Dorsal view.
- FIG. 47. *O. pacifica* from same host. Enlarged view of male terminal reproductive organs.
- FIG. 48. *Cymbephallus carangi* Yamaguti from *Selar crumenophthalmus*. Ventral view.
- FIG. 49. *C. carangi* from same host. Enlarged view of anterior end.
- FIG. 50. *C. carangi*. Eggs.
- FIG. 51. *Parvacreadium bifidum* from goby. Ventral view.
- FIG. 52. *P. bifidum*. Enlarged view of acetabular lobes.
- FIG. 53. *P. bifidum*. Enlarged, dorsal view of anterior end.
- FIG. 54. *P. bifidum*. Outline of posterior end of body showing papilla-like processes.
- FIG. 55. Same.

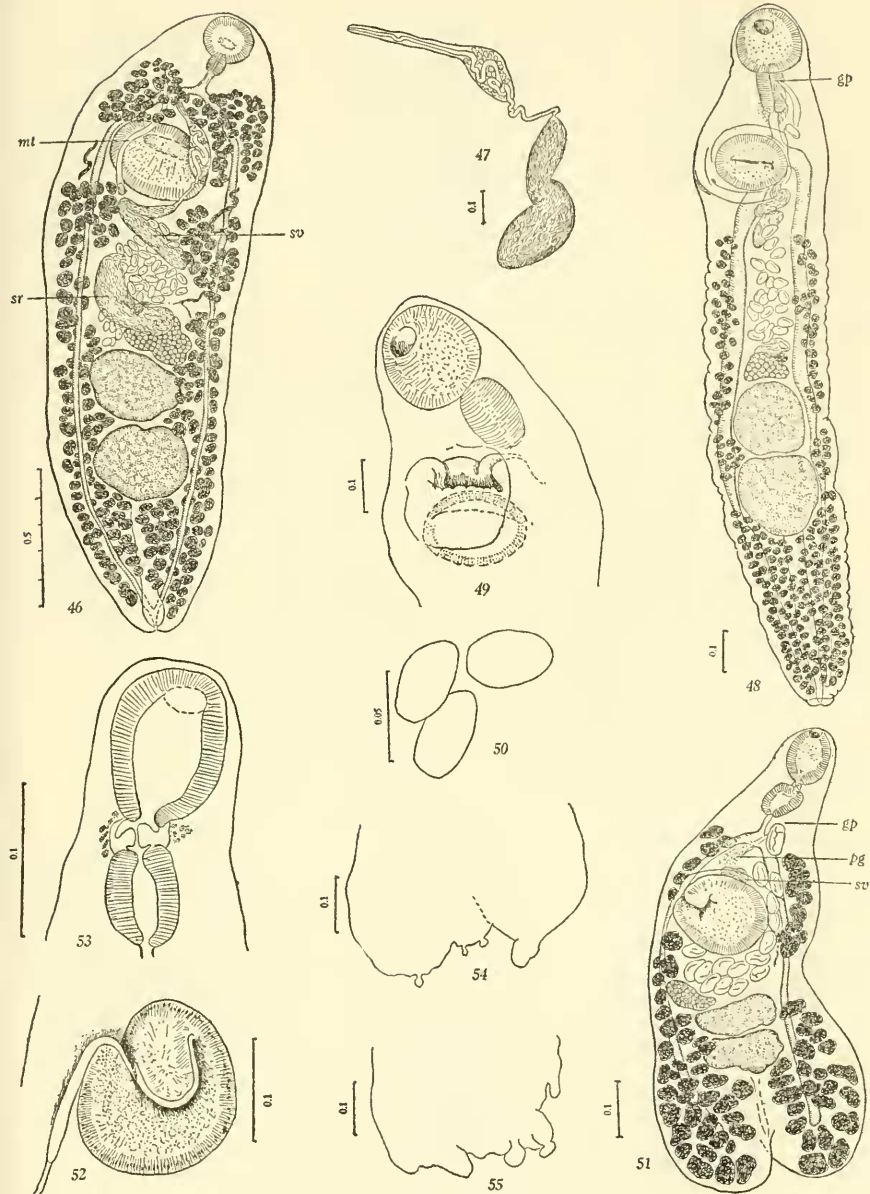


PLATE 39

- FIG. 56. *Bianium adplicatum* from *Cheilichthys annulatus*. Dorsal view.
- FIG. 57. *B. adplicatum*. Enlarged view of pharynx.
- FIG. 58. *Myzotus vitellosus* from *Caulolatilus* sp. Ventral view.
- FIG. 59. *M. vitellosus*. Enlarged view of acetabular region to show acetabular flaps.
- FIG. 60. *M. vitellosus*. Sagittal section through acetabular region showing location of genital pore and muscular structure of acetabulum.
- FIG. 61. *Plagioporus gastrocotylus* from *Calamus brachysomus*. Ventral view.
- FIG. 62. *P. gastrocotylus*. Cross section through acetabular region showing acetabular fold.
- FIG. 63. *P. gastrocotylus*. Longitudinal section through acetabular region.

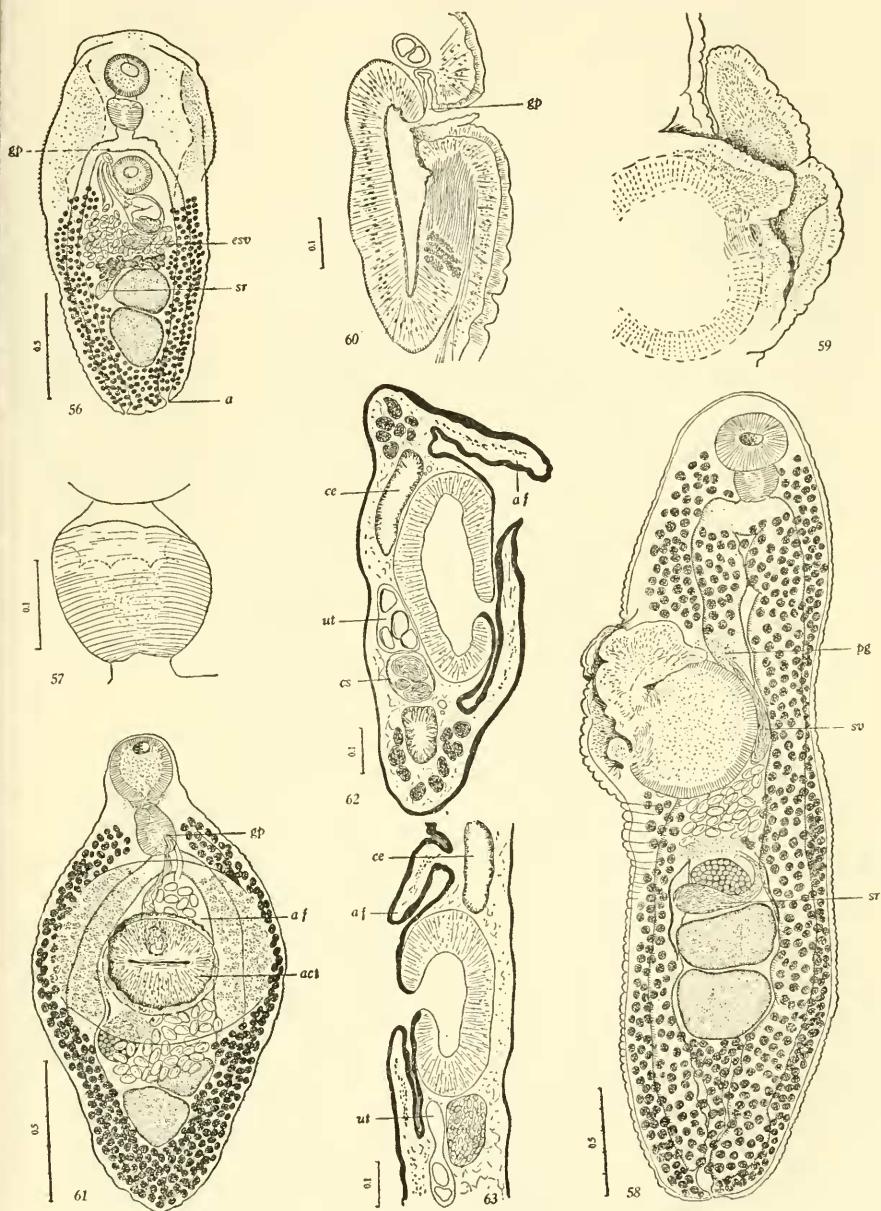


PLATE 40

- FIG. 64. *Hamacreadium mutabile* Linton from *Lutianus viridis*. Ventral view.
- FIG. 65. *Podocotyle mecopera* from a large, spotted grouper. Dorsal view.
- FIG. 66. *Podocotyle breviformis* from *Anisotremus scapularis*. Ventral view.
- FIG. 67. *P. breviformis*. Enlarged, dorsal view of the cirrus sac region.
- FIG. 68. *P. breviformis*. Eggs.
- FIG. 69. *Helicometrina nimia* from *Paralabrax nebulifer*. Dorsal view.
- FIG. 70. *Labrifer secundus*. Ventral view.

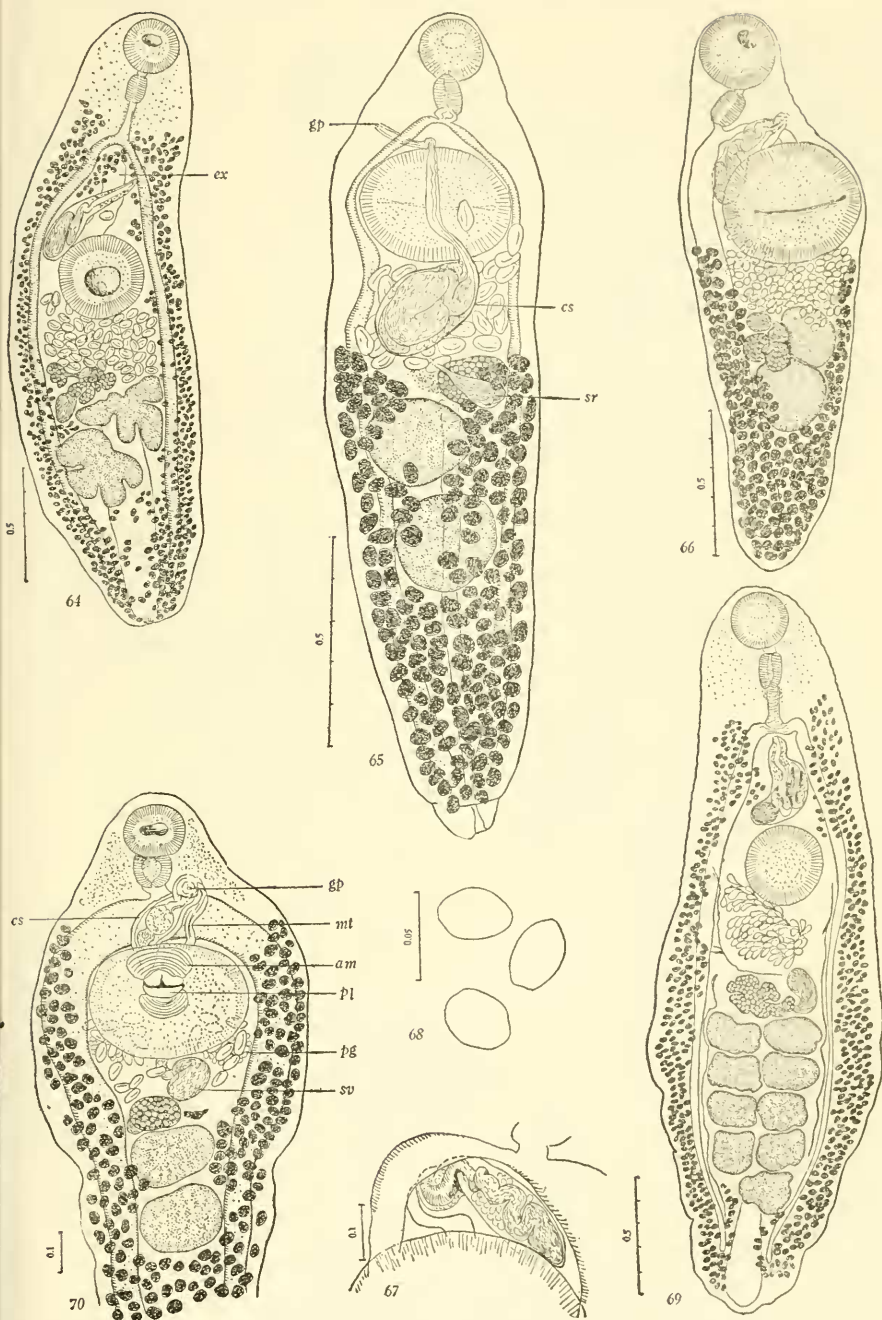


PLATE 41

- FIG. 71. *Stephanostomum megacephalum* from *Caranx hippos*. Ventral view.
- FIG. 72. *S. megacephalum* from *C. hippos*. Enlarged view of anterior end.
- FIG. 73. Same.
- FIG. 74. *Stephanostomum megacephalum* from *Caranx hippos*. Semi-ventral view.
- FIG. 75. *Stephanostomum longisomum*. Ventral view.
- FIG. 76. *S. longisomum*. Enlarged view of anterior end.
- FIG. 77. *Stephanostomum multispinosum* from *Mycteroperca olfax*. Ventral view.
- FIG. 78. *S. multispinosum* from *Mycteroperca* sp. Enlarged view of anterior end.

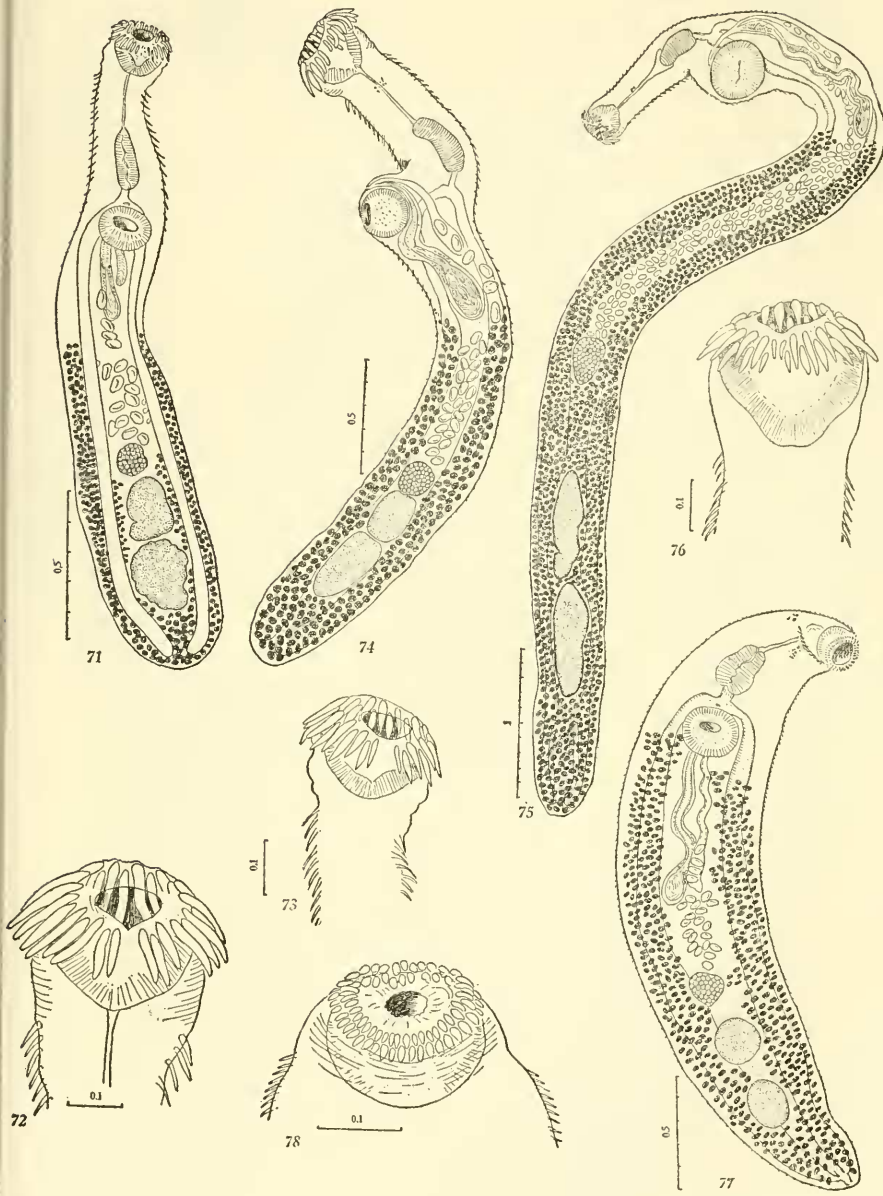


PLATE 42

- FIG. 79. *Stephanostomum hispidum* Yamaguti from *Seriola dorsalis*. Ventral view.
- FIG. 80. *S. hispidum*. Enlarged view of anterior end.
- FIG. 81. *Stephanostomum anisotremi* from *Anisotremus scapularis*. Ventral view.
- FIG. 82. *S. anisotremi*. Enlarged view of anterior end.

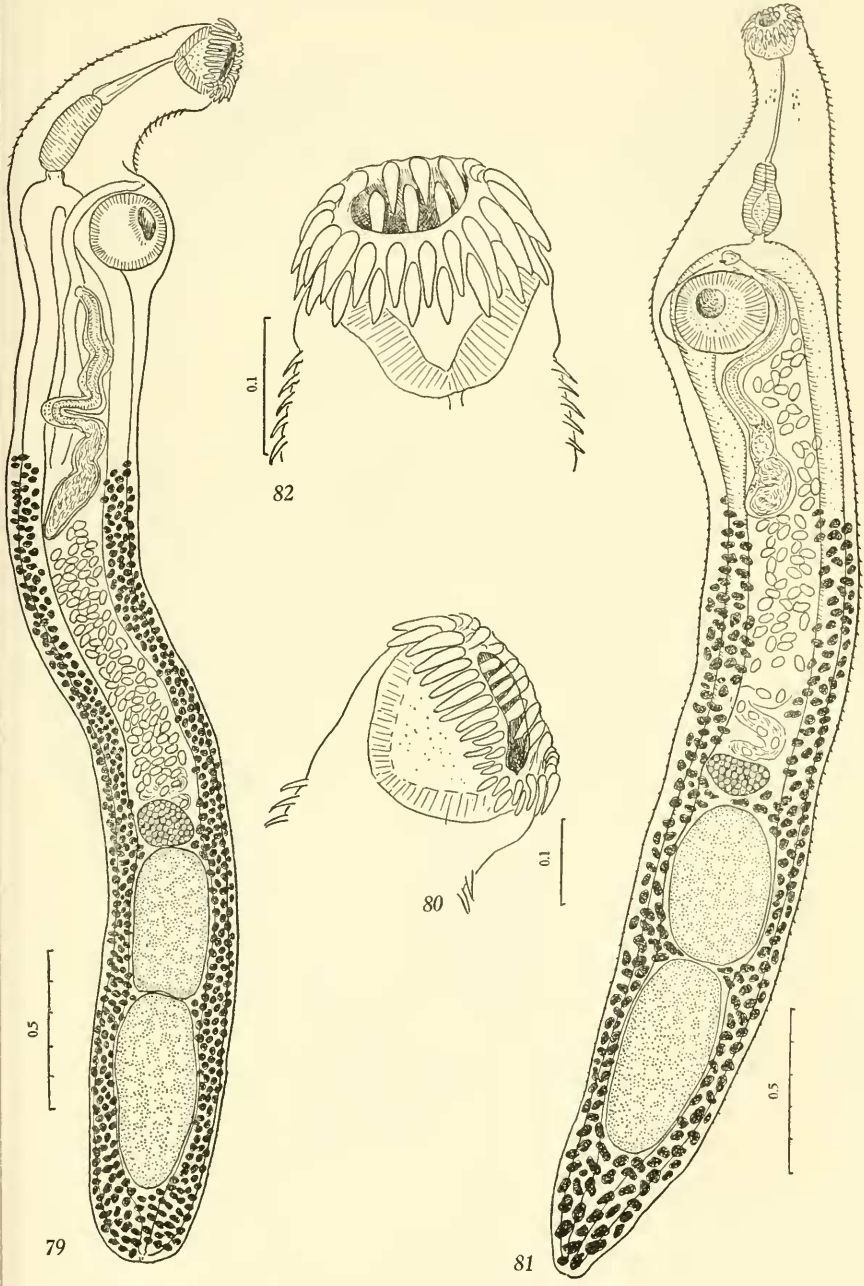


PLATE 43

- FIG. 83. *Dihemistephanus brachyderus* from *Oligoplites saurus*. Ventral view.
- FIG. 84. *D. brachyderus* from same host. Enlarged view of anterior end.
- FIG. 85. *D. brachyderus*. Enlarged view of anterior end.
- FIG. 86. *D. brachyderus*. Cross sections through aperture of oral sucker.

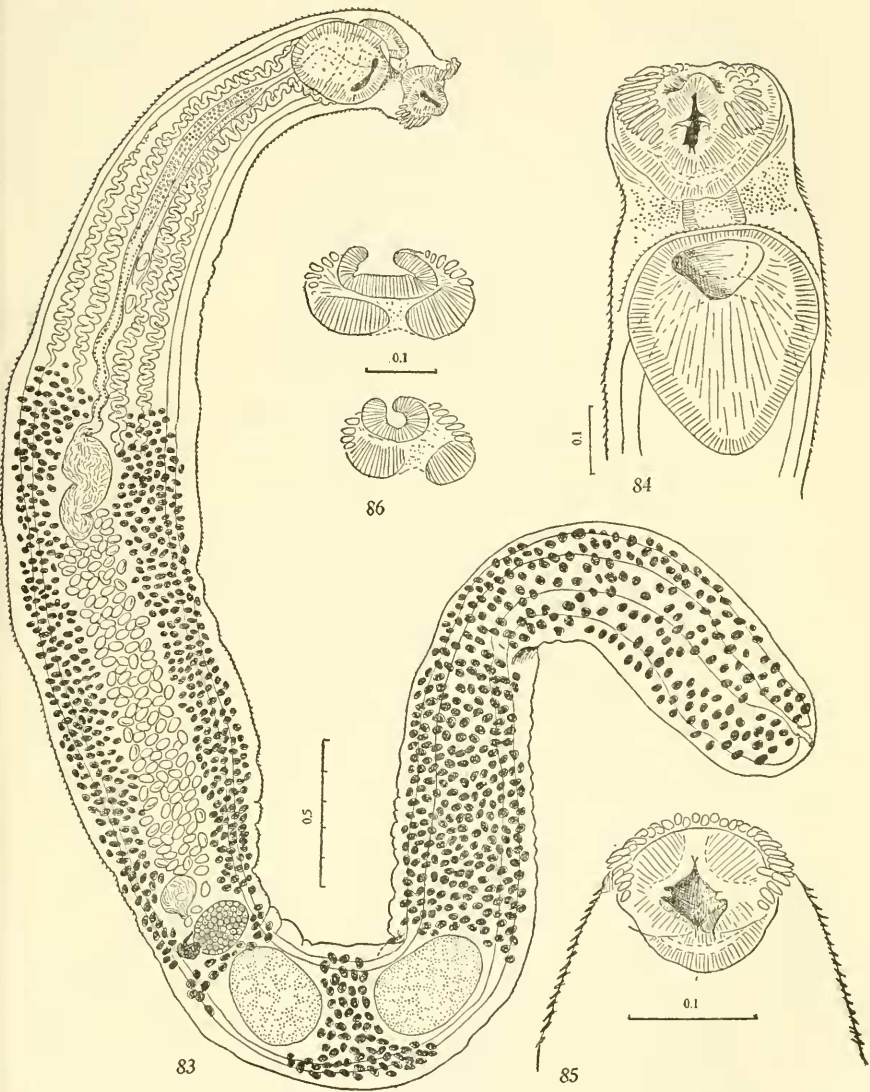


PLATE 44

- FIG. 87. *Proctotrema longicaecum* from *Anisotremus interruptus*. Ventral view.
- FIG. 88. *P. longicaecum*. Enlarged view of acetabular region showing metraterm sac.
- FIG. 89. *P. longicaecum* from *Anisotremus virginicus* at Tortugas, Florida.
- FIG. 90. *Proctotrema costaricae* from unidentified grunt or porgy. Dorsal view.
- FIG. 91. *Paramonorcheides bivitellosus* from *Symphurus atramentatus*. Ventral view.
- FIG. 92. *Telolecithus tropicus* from *Selar crumenophthalmus*. Ventral view.
- FIG. 93. *T. tropicus*. Enlarged view of acetabular region showing terminal reproductive organs.
- FIG. 94. *T. tropicus*. Eggs.

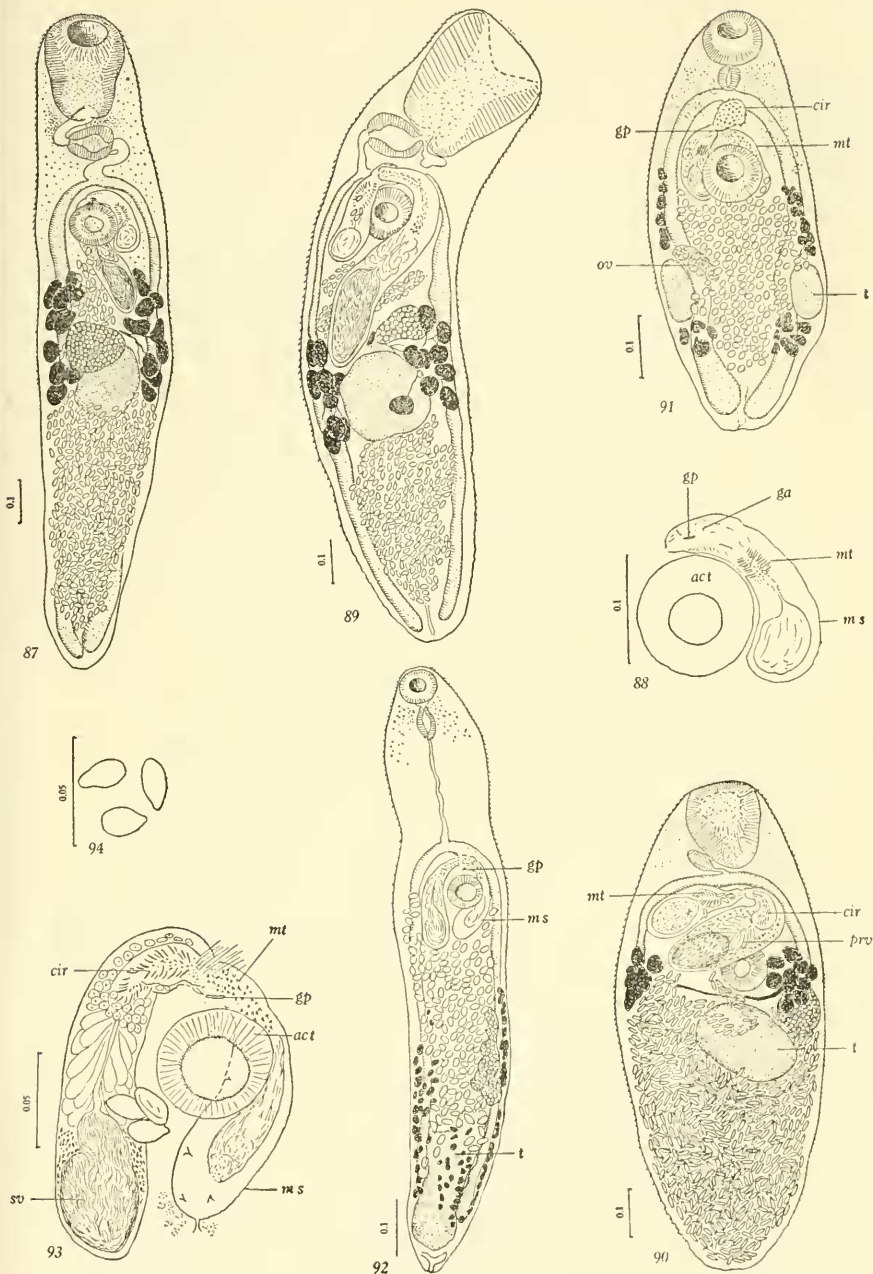


PLATE 45

- FIG. 95. *Proctoeces magnorus* from *Caulolatilus anomalus*. Ventrolateral view.
- FIG. 96. *Tetrochetus proctocolus* from *Cheilichthys annulatus*. Ventral view.
- FIG. 97. *T. proctocolus*. Enlarged, dorsal view of region of intestinal bifurcation showing esophageal diverticula.
- FIG. 98. *Paracryptogonimus americanus* from *Lutianus novemfasciatus*. Ventral view.
- FIG. 99. *P. americanus*. Longitudinal section through oral sucker.
- FIG. 100. *P. americanus*. Eggs.
- FIG. 101. *Siphoderoides vanceleveii* from *Orthostoechus maculicauda*. Ventral view.
- FIG. 102. *S. vanceleveii*. Enlarged, ventral view of acetabular region showing gonotyl.

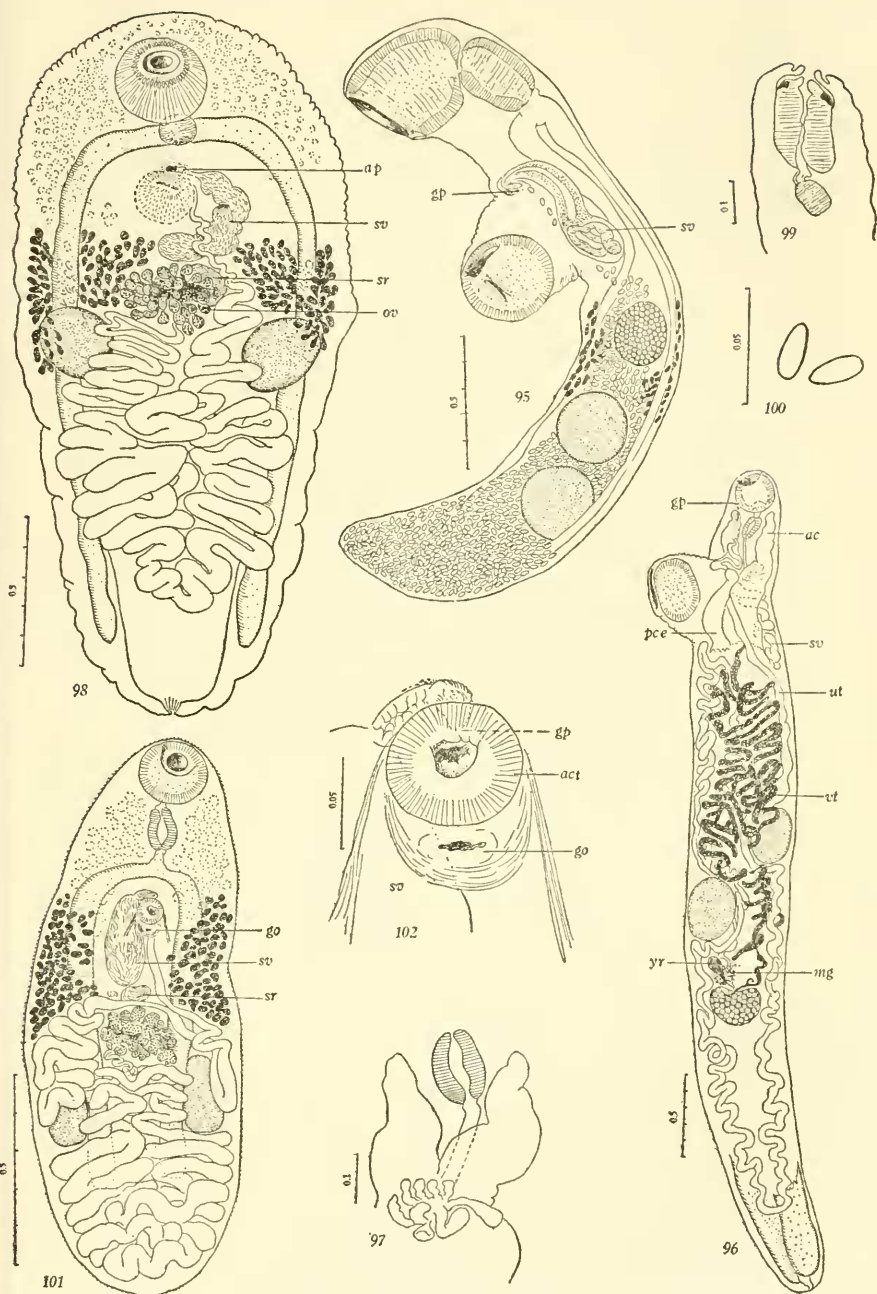


PLATE 46

- FIG. 103. *Parahemiurus merus* from *Opisthonema libertate*. Dorsal view to show extent of denticulations.
- FIG. 104. *Parahemiurus ecuadori* from *Anchoviella* sp. Semiventral view.
- FIG. 105. *Elytrophallus mexicanus* from *Lutianus viridis*. Ventral view.
- FIG. 106. *E. mexicanus*. Diagram of terminal reproductive organs.
- FIG. 107. *E. mexicanus* from *Paranthias furcifer*. Thin-walled portion of sinus sac showing the coiled penis-like sinus.
- FIG. 108. *Mecoderus oligoplitis* from *Oligoplites saurus*. Ventral view of anterior end of body showing oral lobes and esophageal diverticulum.

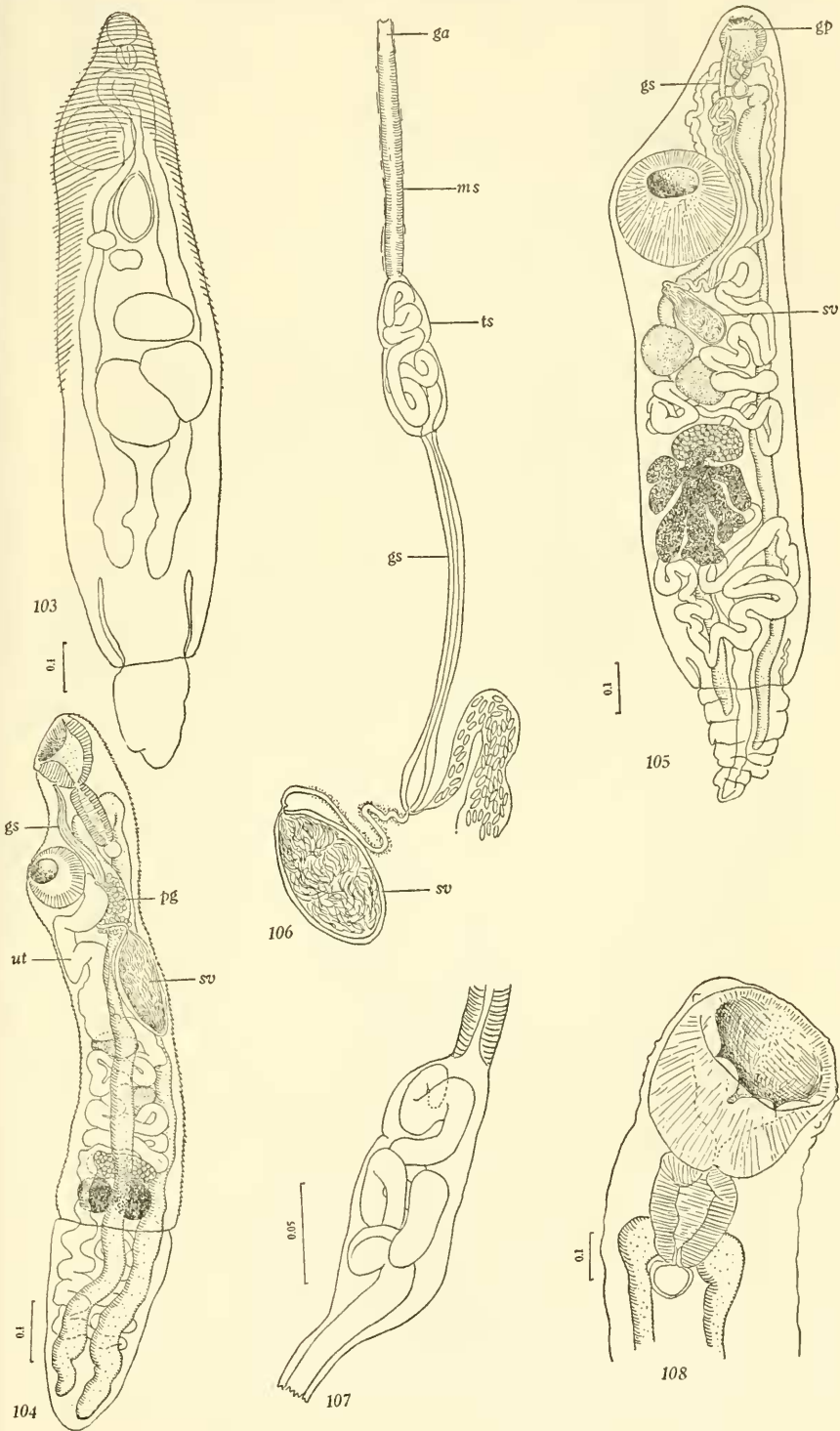


PLATE 47

- FIG. 109. *Mecoderus oligoplitis* from *Oligoplites saurus*. Ventral view.
- FIG. 110. *M. oligoplitis*. Diagram of terminal reproductive organs.
- FIG. 111. *Lecithochirium microstomum* Chandler from *Paranthias furcifer*. Enlarged, semiventral view of forebody region showing presomatic pit and terminal reproductive organs.
- FIG. 112. *L. microstomum*. Vitellaria.
- FIG. 113. *L. microstomum*. Eggs, showing variation.
- FIG. 114. *Lecithochirium magnaporum* from *Paralabrax humeralis*. Ventral view.
- FIG. 115. *L. magnaporum*. Enlarged view of anterior portion of body showing presomatic pit and terminal reproductive organs.
- FIG. 116. *L. magnaporum*. Eggs.

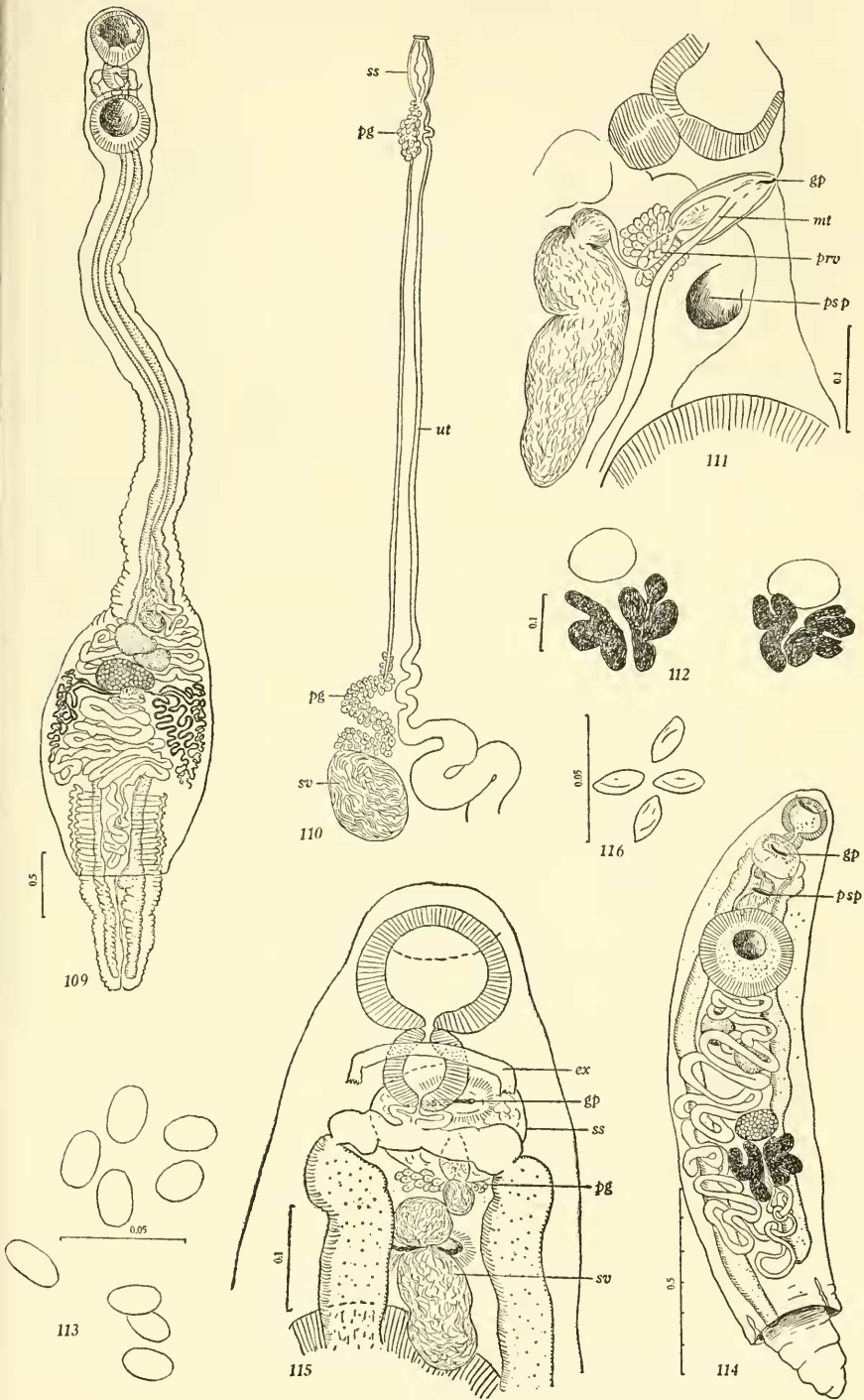


PLATE 48

- FIG. 117. *Lecithochirium muraenae* from *Muraena clepsydra*. Ventral view.
- FIG. 118. *L. muraenae*. Enlarged, dorsal view of terminal reproductive organs.
- FIG. 119. *Theletrum lissosomum* from angelfish. Ventral view.
- FIG. 120. *T. lissosomum*. Sagittal section through region of sinus sac.
- FIG. 121. *T. lissosomum*. Vitellaria.

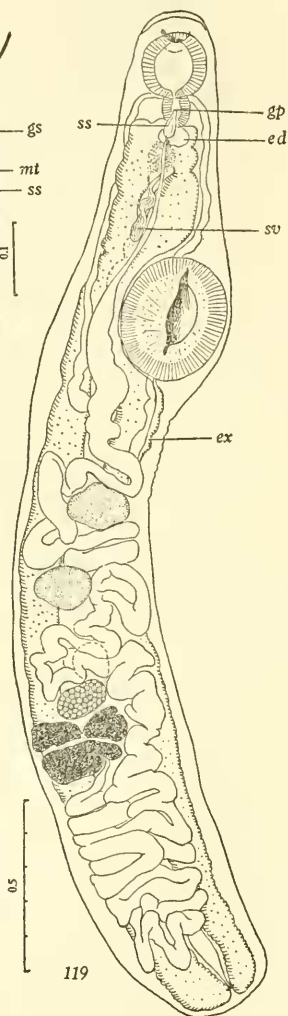
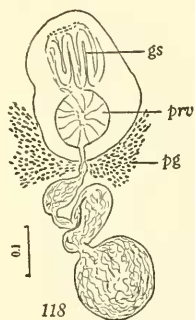
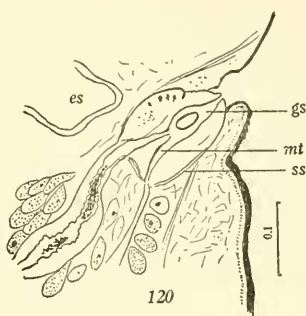
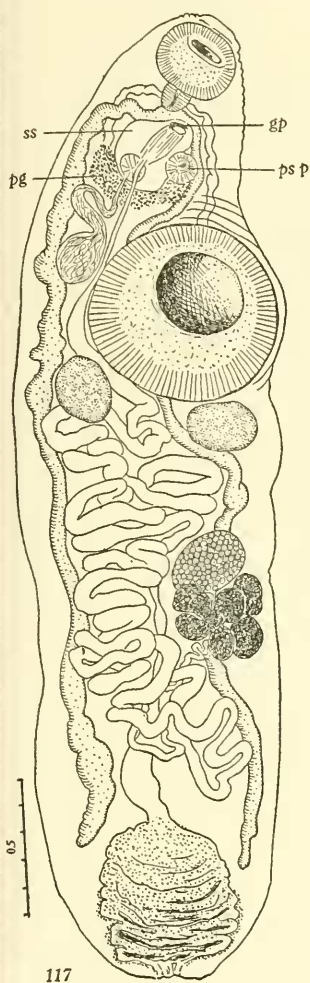


PLATE 49

- FIG. 122. *Theletrum gravidum* from *Abudefduf saxatilis*. Dorsal view.
- FIG. 123. *T. gravidum*. Lateral view of terminal reproductive organs.
- FIG. 124. *Aponurus trachinoti* from *Trachinotus rhodopus*. Dorsal view.
- FIG. 125. *A. trachinoti*. Eggs.
- FIG. 126. *Leurodera pacifica* from *Anisotremus scapularis*. Ventral view.
- FIG. 127. *L. pacifica*. Eggs.
- FIG. 128. *Gonocercella pacifica* from *Trachinotus rhodopus*. Ventral view.

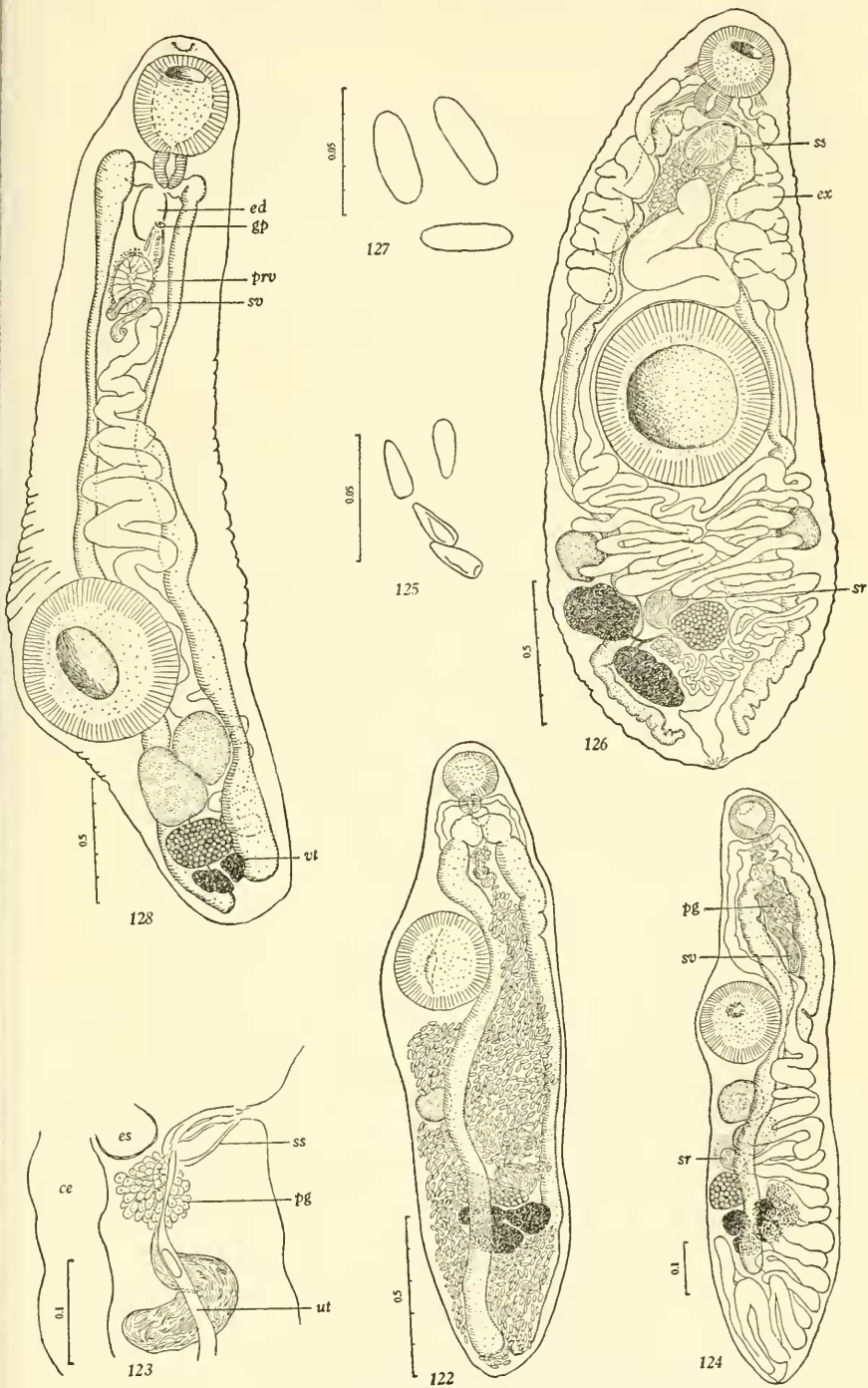


PLATE 50

- FIG. 129. *Paronatrema mantae* from *Manta birostris*. Dorsal view.
- FIG. 130. *P. mantae*. Enlarged view of accessory suckers of oral suckers.
- FIG. 131. *P. mantae*. Enlarged view of accessory suckers of acetabulum.
- FIG. 132. *P. mantae*. Enlarged, ventral view of posterior end of body showing excretory vesicle.
- FIG. 133. *P. mantae*. Enlarged, ventral view of terminal reproductive organs.
- FIG. 134. *Psettarium tropicum* from *Cheilichthys annulatus*. Dorsal view.
- FIG. 135. *P. tropicum*. Diagram of posterior end of body showing reproductive organs. The uterine pore is ventral; the male pore dorsal.
- FIG. 136. *P. tropicum*. Eggs.

